UNIVERSITY OF MUMBAI
No. UG/63 of 2018-19

CIRCULAR:-

Attention of the Principals of the affiliated Colleges and Directors of the recognized Institutions in Science & Technology Faculty is invited to this office Circular Nos. UG/108 of 2017-18, dated 27th July, 2017 relating to syllabus of the Bachelor of Science (B.Sc.) degree course.

They are hereby informed that the recommendations made by the Ad-hoc Board of Studies in Computer Science at its meeting held on 10th May, 2018 have been accepted by the Academic Council at its meeting held on 14th June, 2018 **vide** item No. 4.40 and that in accordance therewith, the revised syllabus as per the (CBCS) for the T.Y.B.Sc. in Computer Science (Sem - V & VI), has been brought into force with effect from the academic year 2018-19, accordingly. (The same is available on the University's website www.mu.ac.in).

(Dr. Dinesh Kamble)
I/c REGISTRAR

MUMBAI – 400 032
6th July, 2018

To

The Principals of the affiliated Colleges & Directors of the recognized Institutions in Science & Technology Faculty. (Circular No. UG/334 of 2017-18 dated 9th January, 2018.)

A.C./4.40/14/06/2018

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No. UG/ 63 -A of 2018 MUMBAI-400 032 6th July, 2018

Copy forwarded with Compliments for information to:-

1) The I/c Dean, Faculty of Science & Technology,
2) The Chairman, Ad-hoc Board of Studies in Computer Science,
3) The Director, Board of Examinations and Evaluation,
4) The Director, Board of Students Development,
5) The Co-Ordinator, University Computerization Centre,

(Dr. Dinesh Kamble)
I/c REGISTRAR

D. E. Society's Kirti M. Doongursee College of Arts, Science & Commerce Mumbai-400028.

Principal,
D. E. SOCIETY'S
Kirti M. Doongursee College
of Arts, Science & Commerce
Dadar (W), Mumbai - 400 028.

Academic Council
Item No: _____

UNIVERSITY OF MUMBAI

Syllabus for Sem V&VI
Program: Bachelor of Science
Course: Computer Science

Choice Based Credit System with effect from
Academic Year 2018-2019

Preamble

This is the third year curriculum in the subject of Computer Science. The revised structure is designed to transform students into technically competent, socially responsible and ethical Computer Science professionals. In these Semesters we have made the advancements in the subject based on the previous Semesters Knowledge.

In the first year basic foundation of important skills required for software development is laid. Second year of this course is about studying core computer science subjects. The third year is the further advancement which covers developing capabilities to design formulations of computing models and its applications in diverse areas.

The proposed curriculum contains two semesters, each Semester contains two Electives: Elective-I and II. Every Elective contains three papers based on specific areas of Computer Science. It also includes one Skill Enhancement paper per semester, helps the student to evaluate his/her computer science domain specific skills and also to meet industry expectations. This revised curriculum has not only taken the specific areas of computer science into consideration but will also give the opportunity to the student to prove his/her ability in the subject practically through the Project Implementation. In Semester V and Semester VI student has to undertake a Project. It can boost his/her confidence and also can encourage the student to perform innovations in the subject as the choice of the Project topic is kept open covering most of the areas of Computer Science subject as per the students interest and the subject they have learned during the Course.

Proposed Curriculum contains challenging and varied subjects aligned with the current trend with the introduction of Machine Intelligence specific subject such as Artificial Intelligence, Information Retrieval. Data Management related subjects such as Cloud Computing and Data Science. Image processing topics such as Game Programming, Digital Image Processing. Introduction of physical world through Architecting of IoT and Wireless Sensor Networks and Mobile Communication. Security domain is also evolved by the introduction of Ethical Hacking, Cyber Forensic and Information and Network Security. To get the hands on experience Linux Server Administration and Web Services topics are included.

In essence, the objective of this syllabus is to create a pool of technologically savvy, theoretically strong, innovatively skilled and ethically responsible generation of computer science professionals. Hope that the teacher and student community of University of Mumbai will accept and appreciate the efforts.

T.Y.B.Sc. (Semester V and VI)
Computer Science Syllabus
Choice Based Credit System
To be implemented from the Academic year 2018-2019

SEMESTER V			
Course	**TOPICS**	**Credits**	**L / Week**
	Elective-I (Select Any Two)		
USCS501	Artificial Intelligence	3	3
USCS502	Linux Server Administration	3	3
USCS503	Software Testing and Quality Assurance	3	3
	Elective-II (Select Any Two)		
USCS504	Information and Network Security	3	3
USCS505	Architecting of IoT	3	3
USCS506	Web Services	3	3
	Skill Enhancement		
USCS507	Game Programming	2	3
	Practical		
USCSP501	Practical of Elective-I	2	6
USCSP502	Practical of Elective-II	2	6
USCSP503	Project Implementation	1	3
USCSP504	Practical of Skill Enhancement : USCS507	1	3

SEMESTER VI			
Course	**TOPICS**	**Credits**	**L / Week**
	Elective-I (Select Any Two)		
USCS601	Wireless Sensor Networks and Mobile Communication	3	3
USCS602	Cloud Computing	3	3
USCS603	Cyber Forensics	3	3
	Elective-II (Select Any Two)		

USCS604	Information Retrieval	3	3
USCS605	Digital Image Processing	3	3
USCS606	Data Science	3	3
	Skill Enhancement		
USCS607	Ethical Hacking	2	3
	Practical		
USCSP601	Practical of Elective-I	2	6
USCSP602	Practical of Elective-II	2	6
USCSP603	Project Implementation	1	3
USCSP604	Practical of Skill Enhancement : USCS607	1	3

SEMESTER V

THEORY

Course: USCS501	TOPICS (Credits : 03 Lectures/Week:03) Artificial Intelligence	
Objectives: Artificial Intelligence (AI) and accompanying tools and techniques bring transformational changes in the world. Machines capability to match, and sometimes even surpass human capability, make AI a hot topic in Computer Science. This course aims to introduce the learner to this interesting area. **Expected Learning Outcomes:** After completion of this course, learner should get a clear understanding of AI and different search algorithms used for solving problems. The learner should also get acquainted with different learning algorithms and models used in machine learning.		
Unit I	**What Is AI:** Foundations, History and State of the Art of AI. **Intelligent Agents:** Agents and Environments, Nature of Environments, Structure of Agents. **Problem Solving by searching:** Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions.	**15L**
Unit II	**Learning from Examples:** Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, Theory of Learning, Regression and Classification with Linear Models, Artificial Neural Networks, Nonparametric Models, Support Vector Machines, Ensemble Learning, Practical Machine Learning	**15L**

Unit III	**Learning probabilistic models:** Statistical Learning, Learning with Complete Data, Learning with Hidden Variables: The EM Algorithm. Reinforcement learning: Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, Applications of Reinforcement Learning.	**15L**

Textbook(s):

1) Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig,3rd Edition, Pearson, 2010.

Additional Reference(s):

1) Artificial Intelligence: Foundations of Computational Agents, David L Poole,Alan K. Mackworth, 2nd Edition, Cambridge University Press ,2017.
2) Artificial Intelligence, Kevin Knight and Elaine Rich, 3rd Edition, 2017
3) The Elements of Statistical Learning, Trevor Hastie, Robert Tibshirani and Jerome Friedman, Springer, 2013

Course:	**TOPICS (Credits : 03 Lectures/Week:03)**
USCS502	**Linux Server Administration**

Objectives:

Demonstrate proficiency with the Linux command line interface, directory & file management techniques, file system organization, and tools commonly found on most Linux distributions. Effectively operate a Linux system inside of a network environment to integrate with existing service solutions. Demonstrate the ability to troubleshoot challenging technical problems typically encountered when operating and administering Linux systems.

Expected Learning Outcomes:

Learner will be able to develop Linux based systems and maintain. Learner will be able to install appropriate service on Linux server as per requirement. Learner will have proficiency in Linux server administration.

Unit I	**Introduction:** Technical Summary of Linux Distributions, Managing Software **Single-Host Administration:** Managing Users and Groups, Booting and shutting down processes, File Systems, Core System Services, Process of configuring, compiling, Linux Kernel **Networking and Security:** TCP/IP for System Administrators, basic network Configuration, Linux Firewall (Netfilter), System and network security	**15L**
Unit II	**Internet Services:** Domain Name System (DNS), File Transfer Protocol (FTP), Apache web server, Simple Mail Transfer Protocol (SMTP), Post Office Protocol and Internet Mail Access Protocol (POP and IMAP), Secure Shell (SSH), Network Authentication, OpenLDAP Server, Samba and LDAP, Network authentication system (Kerberos), Domain Name Service (DNS), Security	**15L**
Unit III	**Intranet Services:** Network File System (NFS), Samba, Distributed File Systems (DFS), Network Information Service (NIS), Lightweight Directory Access Protocol (LDAP), Dynamic Host Configuration Protocol (DHCP), MySQL, LAMP Applications File Servers, Email Services, Chat Applications, Virtual Private Networking.	**15L**

Textbook(s):

1) Linux Administration: A Beginner's Guide, Wale Soyinka, Seventh Edition, McGraw-Hill Education, 2016
2) Ubuntu Server Guide, Ubuntu Documentation Team, 2016

Additional Reference(s):

1) Mastering Ubuntu Server, Jay LaCroix, PACKT Publisher, 2016

Course: USCS503	TOPICS (Credits : 03 Lectures/Week:03) Software Testing and Quality Assurance	
Objectives: To provide learner with knowledge in Software Testing techniques. To understand how testing methods can be used as an effective tools in providing quality assurance concerning for software. To provide skills to design test case plan for testing software **Expected Learning Outcomes:** Understand various software testing methods and strategies. Understand a variety of software metrics, and identify defects and managing those defects for improvement in quality for given software. Design SQA activities, SQA strategy, formal technical review report for software quality control and assurance.		
Unit I	**Software Testing and Introduction to quality :** Introduction, Nature of errors, an example for Testing, Definition of Quality , QA, QC, QM and SQA , Software Development Life Cycle, Software Quality Factors **Verification and Validation :** Definition of V &V , Different types of V & V Mechanisms, Concepts of Software Reviews, Inspection and Walkthrough **Software Testing Techniques :** Testing Fundamentals, Test Case Design, White Box Testing and its types, Black Box Testing and its types	**15L**
Unit II	**Software Testing Strategies :** Strategic Approach to Software Testing, Unit Testing, Integration Testing, Validation Testing, System Testing **Software Metrics :** Concept and Developing Metrics, Different types of Metrics, Complexity metrics **Defect Management:** Definition of Defects, Defect Management Process, Defect Reporting, Metrics Related to Defects, Using Defects for Process Improvement.	**15L**
Unit III	**Software Quality Assurance :** Quality Concepts, Quality Movement, Background Issues, SQA activities, Software Reviews, Formal Technical Reviews, Formal approaches to SQA, Statistical Quality Assurance, Software Reliability, The ISO 9000 Quality Standards, , SQA Plan , Six sigma, Informal Reviews	**15L**

	Quality Improvement : Introduction, Pareto Diagrams, Cause-effect Diagrams, Scatter Diagrams, Run charts **Quality Costs :** Defining Quality Costs, Types of Quality Costs, Quality Cost Measurement, Utilizing Quality Costs for Decision-Making	

Textbook(s):

1. Software Engineering for Students, A Programming Approach, Douglas Bell, 4th Edition,, Pearson Education, 2005
2. Software Engineering – A Practitioners Approach, Roger S. Pressman, 5th Edition, Tata McGraw Hill, 2001
3. Quality Management, Donna C. S. Summers, 5th Edition, Prentice-Hall, 2010.
4. Total Quality Management, Dale H. Besterfield, 3rd Edition, Prentice Hall, 2003.

Additional Reference(s):

1. Software engineering: An Engineering approach, J.F. Peters, W. Pedrycz , John Wiley,2004
2. Software Testing and Quality Assurance Theory and Practice, Kshirsagar Naik, Priyadarshi Tripathy , John Wiley & Sons, Inc. , Publication, 2008
3. Software Engineering and Testing, B. B. Agarwal, S. P. Tayal, M. Gupta, Jones and Bartlett Publishers, 2010

Course:	**TOPICS (Credits : 03 Lectures/Week:03)**
USCS504	**Information and Network Security**

Objectives:

To provide students with knowledge of basic concepts of computer security including network security and cryptography.

Expected Learning Outcomes:

Understand the principles and practices of cryptographic techniques. Understand a variety of generic security threats and vulnerabilities, and identify & analyze particular security problems for a given application. Understand various protocols for network security to protect against the threats in a network

Unit I	**Introduction:** Security Trends, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms **Classical Encryption Techniques:** Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography, Block Cipher Principles, The Data Encryption Standard, The Strength of DES, AES (round details not expected), Multiple Encryption and Triple DES, Block Cipher Modes of Operation, Stream Ciphers **Public-Key Cryptography and RSA:** Principles of Public-Key Cryptosystems, The RSA Algorithm	**15L**
Unit II	**Key Management:** Public-Key Cryptosystems, Key Management, Diffie-Hellman Key Exchange **Message Authentication and Hash Functions**: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Security of Hash Functions and Macs, Secure Hash Algorithm, HMAC **Digital Signatures and Authentication:** Digital Signatures, Authentication Protocols, Digital Signature Standard **Authentication Applications:** Kerberos, X.509 Authentication, Public-Key Infrastructure	**15L**
Unit III	**Electronic Mail Security:** Pretty Good Privacy, S/MIME **IP Security:** Overview, Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations, Key Management **Web Security:** Web Security Considerations, Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction **Intrusion:** Intruders, Intrusion Techniques, Intrusion Detection **Malicious Software:** Viruses and Related Threats, Virus Countermeasures, DDOS **Firewalls:** Firewall Design Principles, Types of Firewalls	**15L**

Textbook(s):

1) Cryptography and Network Security: Principles and Practice 5th Edition, William

Stallings, Pearson,2010

Additional Reference(s):

1) Cryptography and Network Security, Atul Kahate, Tata McGraw-Hill, 2013.
2) Cryptography and Network, Behrouz A Fourouzan, Debdeep Mukhopadhyay, 2nd Edition,TMH,2011

Course: **USCS505**	**TOPICS (Credits : 03 Lectures/Week:03)** **Architecting of IoT**	
Objectives: Discovering the interconnection and integration of the physical world. Learner should get knowledge of the architecture of IoT. **Expected Learning Outcomes:** Learners are able to design & develop IoT Devices. They should also be aware of the evolving world of M2M Communications and IoT analytics.		
Unit I	**IoT-An Architectural Overview**: Building architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. **IoT Architecture-State of the Art** : Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference Architecture Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views	**15L**
Unit II	**IoT Data Link Layer and Network Layer Protocols:** PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART,Z-Wave, Bluetooth Low Energy, Zigbee Smart Energy DASH7 **Network Layer**:IPv4, IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP	**15L**

Unit III	**Transport layer protocols :** Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) **Session layer:** Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT **Service layer protocols:** Service Layer -oneM2M, ETSI M2M, OMA, BBF	**15L**

Textbook(s):

1. From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle,1st Edition, Academic Press, 2014.
2. Learning Internet of Things, Peter Waher, PACKT publishing, BIRMINGHAM – MUMBAI,2015

Additional References(s):

1. Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications, Daniel Minoli, Wiley Publications,2013
2. Internet of Things (A Hands-onApproach), Vijay Madisetti and ArshdeepBahga,1st Edition, VPT, 2014.
3. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html

Course: **USCS506**	**TOPICS (Credits : 03 Lectures/Week:03)** **Web Services**

Objectives:

To understand the details of web services technologies like SOAP, WSDL, and UDDI. To learn how to implement and deploy web service client and server. To understand the design principles and application of SOAP and REST based web services (JAX-Ws and JAX-RS).To understand WCF service. To design secure web services and QoS of Web Services

Expected Learning Outcomes:

Emphasis on SOAP based web services and associated standards such as WSDL. Design SOAP based / RESTful / WCF services Deal with Security and QoS issues of Web Services

Unit I	**Web services basics :** What Are Web Services? Types of Web Services Distributed computing infrastructure, overview of XML, SOAP, Building Web Services with JAX-WS, Registering and Discovering Web Services, Service Oriented Architecture, Web Services Development Life Cycle, Developing and consuming simple Web Services across platform	**15L**
Unit II	**The REST Architectural style :** Introducing HTTP, The core architectural elements of a RESTful system, Description and discovery of RESTful web services, Java tools and frameworks for building RESTful web services, JSON message format and tools and frameworks around JSON, Build RESTful web services with JAX-RS APIs, The Description and Discovery of RESTful Web Services, Design guidelines for building RESTful web services, Secure RESTful web services	**15L**
Unit III	**Developing Service-Oriented Applications with WCF :** What Is Windows Communication Foundation, Fundamental Windows Communication Foundation Concepts, Windows Communication Foundation Architecture, WCF and .NET Framework Client Profile, Basic WCF Programming, WCF Feature Details. Web Service QoS	**15L**

Textbook(s):

1) Web Services: Principles and Technology, Michael P. Papazoglou, Pearson Education Limited, 2008
2) RESTful Java Web Services, Jobinesh Purushothaman, PACKT Publishing,2nd Edition, 2015
3) Developing Service-Oriented Applications with WCF, Microsoft, 2017 https://docs.microsoft.com/en-us/dotnet/framework/wcf/index

Additional Reference(s):

1) Leonard Richardson and Sam Ruby, RESTful Web Services, O'Reilly, 2007
2) The Java EE 6Tutorial, Oracle, 2013

Course: USCS507	TOPICS (Credits : 03 Lectures/Week: 03) Game Programming	
Objectives: Learner should get the understanding computer Graphics programming using Directx or Opengl. Along with the VR and AR they should also aware of GPU, newer technologies and programming using most important API for windows. **Expected Learning Outcomes:** Learner should study Graphics and gamming concepts with present working style of developers where everything remains on internet and they need to review it, understand it, be a part of community and learn.		
Unit I	**Mathematics for Computer Graphics, DirectX Kickstart:** **Cartesian Coordinate system:** The Cartesian XY-plane, Function Graphs, Geometric Shapes, Polygonal Shapes, Areas of Shapes, Theorem of Pythagoras in 2D, Coordinates, Theorem of Pythagoras in 3D, 3D Polygons, Euler's Rule **Vectors:** Vector Manipulation, multiplying a Vector by a Scalar, Vector Addition and Subtraction, Position Vectors, Unit Vectors, Cartesian Vectors, Vector Multiplication, Scalar Product, Example of the Dot Product, The Dot Product in Lighting Calculations, The Dot Product in Back-Face Detection, The Vector Product, The Right-Hand Rule, deriving a Unit Normal Vector for a Triangle Areas, Calculating 2D Areas **Transformations:** 2D Transformations, Matrices, Homogeneous Coordinates, 3D Transformations, Change of Axes, Direction Cosines, rotating a Point about an Arbitrary Axis, Transforming Vectors, Determinants, Perspective Projection, Interpolation **DirectX:** Understanding GPU and GPU architectures. How they are different from CPU Architectures? Understanding how to solve by GPU?	**15L**

Unit II	**DirectX Pipeline and Programming:** **Introduction To DirectX 11:** COM, Textures and Resources Formats, The swap chain and Page flipping, Depth Buffering, Texture Resource Views, Multisampling Theory and MS in Direct3D, Feature Levels **Direct3D 11 Rendering Pipeline:** Overview, Input Assembler Stage (IA), Vertex Shader Stage (VS), The Tessellation Stage (TS), Geometry Shader Stage (GS), Pixel Shader Stage (PS), Output merger Stage (OM) Understanding Meshes or Objects, Texturing, Lighting, Blending. **Interpolation and Character Animation:** **Trigonometry:** The Trigonometric Ratios, Inverse Trigonometric Ratios, Trigonometric Relationships, The Sine Rule, The Cosine Rule, Compound Angles, Perimeter Relationships **Interpolation**: Linear Interpolant, Non-Linear Interpolation, Trigonometric Interpolation, Cubic Interpolation, Interpolating Vectors, Interpolating Quaternions **Curves:** Circle, Bezier, B-Splines **Analytic Geometry:** Review of Geometry, 2D Analytic Geometry, Intersection Points, Point in Triangle, and Intersection of circle with straight line.	**15L**
Unit III	**Introduction to Rendering Engines:** Understanding the current market Rendering Engines. Understanding AR, VR and MR.Depth Mappers, Mobile Phones, Smart Glasses, HMD's **Unity Engine: Multi-platform publishing, VR + AR:** Introduction and working in Unity, 2D, Graphics, Physics, Scripting, Animation, Timeline, Multiplayer and Networking, UI, Navigation and Pathfinding, XR, Publishing. **Scripting:** Scripting Overview, Scripting Tools and Event Overview **XR:** VR, AR, MR, Conceptual Differences. SDK, Devices	**15L**

Text Book(s):

1) Mathematics for Computer Graphics, John Vince, Springer-Verlag London, 5th Edition,2017
2) Mathematics for 3D Game Programming and Computer Graphic, Eric Lengyel, Delmar

Cengage Learning, Delmar Cengage Learning,2011

3) Introduction To 3D Game Programming With Directx® 11,Frank D Luna, Mercury Learning And Information,2012.
4) https://docs.unity3d.com/Manual/index.html - Free

Additional Reference(s):

1) Computer Graphics, C Version, Donald Hern and Pauline Baker, Pearson Education, 2nd Edition, 1997
2) HLSL Development Cookbook, Doron Feinstein, PACKT Publishing,2013

Suggested List of Practical- SEMESTER V

Course: **USCSP501**	**(Credits : 02 Lectures/Week: 06)** **Practical of Elective-I**	

USCS501: Artificial Intelligence

Practical shall be implemented in Python

1. Implement Breadth first search algorithm for Romanian map problem.
2. Implement Iterative deep depth first search for Romanian map problem.
3. Implement A* search algorithm for Romanian map problem.
4. Implement recursive best-first search algorithm for Romanian map problem.
5. Implement decision tree learning algorithm for the restaurant waiting problem.
6. Implement feed forward back propagation neural network learning algorithm for the restaurant waiting problem.
7. Implement Adaboost ensemble learning algorithm for the restaurant waiting problem.
8. Implement Naive Bayes' learning algorithm for the restaurant waiting problem.
9. Implement passive reinforcement learning algorithm based on adaptive dynamic programming (ADP) for the 3 by 4 world problem
10. Implement passive reinforcement learning algorithm based on temporal differences (TD) for 3 by 4 world problem.

USCS502: Linux Server Administration

- Practical shall be performed using any Linux Server (with 8GB RAM).

- Internet connection will be required so that Linux server (command line mode) can be connected to Internet.

1. Install DHCP Server in Ubuntu 16.04
2. Initial settings: Add a User, Network Settings, Change to static IP address, Disable IPv6 if not needed, Configure Services, display the list of services which are running, Stop and turn OFF auto-start setting for a service if you don't need it, Sudo Settings
3. Configure NTP Server (NTPd), Install and Configure NTPd, Configure NTP Client (Ubuntu and Windows)
4. SSH Server : Password Authentication

Configure SSH Server to manage a server from the remote computer, SSH Client : (Ubuntu and Windows)

5. Install DNS Server BIND, Configure DNS server which resolves domain name or IP address, Install BIND 9, Configure BIND, Limit ranges you allow to access if needed.
6. Configure DHCP Server, Configure DHCP (Dynamic Host Configuration Protocol) Server, Configure NFS Server to share directories on your Network, Configure NFS Client. (Ubuntu and Windows Client OS)
7. Configure LDAP Server, Configure LDAP Server in order to share users' accounts in your local networks, Add LDAP User Accounts in the OpenLDAP Server, Configure LDAP Client in order to share users' accounts in your local networks. Install phpLDAPadmin to operate LDAP server via Web browser.
8. Configure NIS Server in order to share users' accounts in your local networks, Configure NIS Client to bind NIS Server.
9. Install MySQL to configure database server, Install phpMyAdmin to operate MySQL on web browser from Clients.
10. Install Samba to share folders or files between Windows and Linux.

USCS503: Software Testing and Quality Assurance

1. Install Selenium IDE; Write a test suite containing minimum 4 test cases for different formats.
2. Conduct a test suite for any two web sites.
3. Install Selenium server (Selenium RC) and demonstrate it using a script in Java/PHP.
4. Write and test a program to login a specific web page.
5. Write and test a program to update 10 student records into table into Excel file
6. Write and test a program to select the number of students who have scored more than 60 in any one subject (or all subjects).
7. Write and test a program to provide total number of objects present / available on the page.
8. Write and test a program to get the number of items in a list / combo box.
9. Write and test a program to count the number of check boxes on the page checked and unchecked count.
10. Load Testing using JMeter, Android Application testing using Appium Tools, Bugzilla Bug tracking tools.

Course: USCSP502	(Credits : 02 Lectures/Week: 06) Practical of Elective-II	

USCS504: Information and Network security

1.Write programs to implement the following Substitution Cipher Techniques:

- Caesar Cipher
- Monoalphabetic Cipher

2 Write programs to implement the following Substitution Cipher Techniques:

- Vernam Cipher
- Playfair Cipher

3 Write programs to implement the following Transposition Cipher Techniques:

- Rail Fence Cipher
- Simple Columnar Technique

4 Write program to encrypt and decrypt strings using

- DES Algorithm
- AES Algorithm

5 Write a program to implement RSA algorithm to perform encryption / decryption of a given string.

6 Write a program to implement the Diffie-Hellman Key Agreement algorithm to generate symmetric keys.

7 Write a program to implement the MD5 algorithm compute the message digest.

8 Write a program to calculate HMAC-SHA1 Signature

9 Write a program to implement SSL.

10 Configure Windows Firewall to block:

- A port
- An Program
- A website

USCS505: Architecting of IoT

1. a) Edit text files with nano and cat editor, Learn sudo privileges and Unix shell commands such as cd , ls , cat, etc

b) Learn to set dynamic and static IP. Connect to and Ethernet and WiFi network. Learn to vnc and ssh into a raspberry pi using vnc and putty from a different computer on the network.

c) Write a basic bash script to open programs in kiosk mode. Learn how to autostart programs on boot.

2. Run the node red editor and run simple programs and trigger gpios. Use basic nodes such as inject, debug, gpio
3. Open the python idle editor and run simple Python scripts such as to print Fibonacci numbers, string functions. Learn how to install modules using Pip and write functions
4. Setup a physical button switch and trigger an led in node red and python w debounce
5. Write simple JavaScript functions in Node-Red simple HTTP server page using node red
6. Setup a TCP server and client on a raspberry pi using Python modules to send messages and execute shell commands from within python such as starting another application
7. Trigger a set of led Gpios on the pi via a Python Flask web server
8. Interface the raspberry pi with a 16x2 LCD display and print values.
9. Setup a Mosquitto MQTT server and client and write a Python script to communicate data between Pi's.
10. Interface with an Accelerometer Gyro Mpu6050 on the i2c bus and send sensor values over the internet via mqtt.

USCS506: Web Services

1. Write a program to implement to create a simple web service that converts the temperature from Fahrenheit to Celsius and vice a versa.
2. Write a program to implement the operation can receive request and will return a response in two ways. a) One - Way operation b) Request –Response
3. Write a program to implement business UDDI Registry entry.
4. Develop client which consumes web services developed in different platform.
5. Write a JAX-WS web service to perform the following operations. Define a Servlet / JSP that consumes the web service.
6. Define a web service method that returns the contents of a database in a JSON string. The contents should be displayed in a tabular format.
7. Define a RESTful web service that accepts the details to be stored in a database and performs

CRUD operation.

8. Implement a typical service and a typical client using WCF.
9. Use WCF to create a basic ASP.NET Asynchronous JavaScript and XML (AJAX) service.
10. Demonstrates using the binding attribute of an endpoint element in WCF.

Course: **USCSP503**	**(Credits : 01 Lectures/Week: 03) Project Implementation**	
Please Refer to Project Implementation Guidelines		
Course: **USCSP504**	**(Credits : 01 Lectures/Week: 03) Practical of Skill Enhancement**	

USCS507 : Game Programming

1. Setup DirectX 11, Window Framework and Initialize Direct3D Device
2. Buffers, Shaders and HLSL (Draw a triangle using Direct3D 11)
3. Texturing (Texture the Triangle using Direct 3D 11)
4. Lightning (Programmable Diffuse Lightning using Direct3D 11)
5. Specular Lightning (Programmable Spot Lightning using Direct3D 11)
6. Loading models into DirectX 11 and rendering.

Perform following Practical using online content from the Unity Tutorials Web--sites: https://unity3d.com/learn/tutorials/s/interactive-tutorials

7. https://unity3d.com/learn/tutorials/s/2d-ufo-tutorial
8. https://unity3d.com/learn/tutorials/s/space-shooter-tutorial
9. https://unity3d.com/learn/tutorials/s/roll-ball-tutorial
10. https://unity3d.com/learn/tutorials/topics/vr/introduction?playlist=22946

SEMESTER VI

THEORY

Course: USCS601	TOPICS (Credits : 03 Lectures/Week: 03) Wireless Sensor Networks and Mobile Communication	
Objectives: In this era of wireless and adhoc network, connecting different wireless devices and understanding their compatibility is very important. Information is gathered in many different ways from these devices. Learner should be able to conceptualize and understand the framework. On completion, will be able to have a firm grip over this very important segment of wireless network. **Expected Learning Outcomes:** After completion of this course, learner should be able to list various applications of wireless sensor networks, describe the concepts, protocols, design, implementation and use of wireless sensor networks. Also implement and evaluate new ideas for solving wireless sensor network design issues.		
Unit I	**Introduction:** Introduction to Sensor Networks, unique constraints and challenges. Advantage of Sensor Networks, Applications of Sensor Networks, Mobile Adhoc NETworks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks. **Sensor Node Hardware and Network Architecture:** Single-node architecture, Hardware components & design constraints, Operating systems and execution environments, introduction to TinyOS and nesC. Network architecture, Optimization goals and figures of merit, Design principles for WSNs, Service interfaces of WSNs, Gateway concepts.	**15L**
Unit II	**Medium Access Control Protocols:** Fundamentals of MAC Protocols, MAC Protocols for WSNs, Sensor-MAC Case Study. **Routing Protocols** : Data Dissemination and Gathering, Routing Challenges and Design Issues in Wireless Sensor Networks, Routing Strategies in Wireless Sensor Networks. **Transport Control Protocols :** Traditional Transport Control Protocols,	**15L**

	Transport Protocol Design Issues, Examples of Existing Transport Control Protocols, Performance of Transport Control Protocols.	
Unit III	**Introduction, Wireless Transmission and Medium Access Control:** Applications, A short history of wireless communication. **Wireless Transmission:** Frequency for radio transmission, Signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread spectrum, Cellular systems. **Telecommunication, Satellite and Broadcast Systems: GSM:** Mobile services, System architecture, Radio interface, Protocols, Localization And Calling, Handover, security, New data services; DECT: System architecture, Protocol architecture; ETRA, UMTS and IMT- 2000. Satellite Systems: History, Applications, Basics: GEO, LEO, MEO; Routing, Localization, Handover.	**15L**

Textbook(s):

1) Protocols and Architectures for Wireless Sensor Network, Holger Kerl, Andreas Willig, John Wiley and Sons, 2005
2) Wireless Sensor Networks Technology, Protocols, and Applications ,Kazem Sohraby, Daniel Minoli and TaiebZnati, John Wiley & Sons, 2007
3) Mobile communications, Jochen Schiller,2nd Edition, Addison wisely , Pearson Education,2012

Additional Reference(s):

1) Fundamentals of Wireless Sensor Networks, Theory and Practice, Waltenegus Dargie, Christian Poellabauer , Wiley Series on wireless Communication and Mobile Computing, 2011
2) Networking Wireless Sensors, Bhaskar Krishnamachari , Cambridge University Press, 2005

Course: USCS602	TOPICS (Credits : 03 Lectures/Week: 03) Cloud Computing	

Objectives:

To provide learners with the comprehensive and in-depth knowledge of Cloud Computing concepts, technologies, architecture, implantations and applications. To expose the learners to frontier areas of Cloud Computing, while providing sufficient foundations to enable further study and research.

Expected Learning Outcomes:

After successfully completion of this course, learner should be able to articulate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing using open source technology. Learner should be able to identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc. They should explain the core issues of cloud computing such as security, privacy, and interoperability.

Unit I	Introduction to Cloud Computing, Characteristics and benefits of Cloud Computing, Basic concepts of Distributed Systems, Web 2.0, Service-Oriented Computing, Utility-Oriented Computing. Elements of Parallel Computing. Elements of Distributed Computing. Technologies for Distributed Computing. Cloud Computing Architecture. The cloud reference model. Infrastructure as a service. Platform as a service. Software as a service. Types of clouds.	**15L**
Unit II	Characteristics of Virtualized Environments. Taxonomy of Virtualization Techniques. Virtualization and Cloud Computing. Pros and Cons of Virtualization. Virtualization using KVM, Creating virtual machines, oVirt - management tool for virtualization environment. Open challenges of Cloud Computing	**15L**
Unit III	Introduction to OpenStack, OpenStack test-drive, Basic OpenStack operations, OpenStack CLI and APIs, Tenant model operations, Quotas, Private cloud building blocks, Controller deployment, Networking deployment, Block Storage deployment, Compute deployment, deploying and utilizing OpenStack in production environments, Building a production environment, Application orchestration using OpenStack Heat	**15L**

Textbook(s):

1) Mastering Cloud Computing, Rajkumar Buyya, Christian Vecchiola, S Thamarai Selvi, Tata McGraw Hill Education Private Limited, 2013
2) OpenStack in Action, V. K. CODY BUMGARDNER, Manning Publications Co, 2016

Additional Reference(s)*:*

1) OpenStack Essentials, Dan Radez, PACKT Publishing, 2015
2) OpenStack Operations Guide, Tom Fifield, Diane Fleming, Anne Gentle, Lorin Hochstein, Jonathan Proulx, Everett Toews, and Joe Topjian, O'Reilly Media, Inc., 2014
3) https://www.openstack.org

Course: **USCS603**	**TOPICS (Credits :03 Lectures/Week:03)** **Cyber Forensics**	

Objectives:

To understand the procedures for identification, preservation, and extraction of electronic evidence, auditing and investigation of network and host system intrusions, analysis and documentation of information gathered

Expected Learning Outcomes :

The student will be able to plan and prepare for all stages of an investigation - detection, initial response and management interaction, investigate various media to collect evidence, report them in a way that would be acceptable in the court of law.

Unit I	**Computer Forensics :** Introduction to Computer Forensics and standard procedure, Incident Verification and System Identification ,Recovery of Erased and damaged data, Disk Imaging and Preservation, Data Encryption and Compression, Automated Search Techniques, Forensics Software **Network Forensic :** Introduction to Network Forensics and tracking network traffic, Reviewing Network Logs, Network Forensics Tools, Performing Live Acquisitions, Order of Volatility, Standard Procedure **Cell Phone and Mobile Device Forensics:** Overview, Acquisition Procedures for Cell Phones and Mobile Devices	**15L**

Unit II	**Internet Forensic :** **Introduction** to Internet Forensics, World Wide Web Threats, Hacking and Illegal access, Obscene and Incident transmission, Domain Name Ownership Investigation, Reconstructing past internet activities and events **E-mail Forensics :** e-mail analysis, e-mail headers and spoofing, Laws against e-mail Crime, **Messenger Forensics:** Yahoo Messenger **Social Media Forensics:** Social Media Investigations **Browser Forensics:** Cookie Storage and Analysis, Analyzing Cache and temporary internet files, Web browsing activity reconstruction	**15L**
Unit III	**Investigation, Evidence presentation and Legal aspects of Digital Forensics:** Authorization to collect the evidence , Acquisition of Evidence, Authentication of the evidence, Analysis of the evidence, Reporting on the findings, Testimony **Introduction to Legal aspects of Digital Forensics:** Laws & regulations, Information Technology Act, Giving Evidence in court, Case Study – Cyber Crime cases, Case Study – Cyber Crime cases	**15L**

Textbook(s):

1. Guide to computer forensics and investigations, Bill Nelson, Amelia Philips and Christopher Steuart, course technology,5th Edition,2015

Additional Reference(s)*:*

2. Incident Response and computer forensics, Kevin Mandia, Chris Prosise, Tata McGrawHill,2nd Edition,2003

Course:	**TOPICS (Credits : 03 Lectures/Week: 03)**	
USCS604	**Information Retrieval**	

Objectives:

To provide an overview of the important issues in classical and web information retrieval. The focus is to give an up-to- date treatment of all aspects of the design and implementation of systems for gathering, indexing, and searching documents and of methods for evaluating systems.

Expected Learning Outcomes:

After completion of this course, learner should get an understanding of the field of information retrieval and its relationship to search engines. It will give the learner an understanding to apply information retrieval models.

Unit I	**Introduction to Information Retrieval:** Introduction, History of IR, Components of IR, and Issues related to IR, Boolean retrieval, Dictionaries and tolerant retrieval.	**15L**
Unit II	**Link Analysis and Specialized Search:** Link Analysis, hubs and authorities, Page Rank and HITS algorithms, Similarity, Hadoop & Map Reduce, Evaluation, Personalized search, Collaborative filtering and content-based recommendation of documents and products, handling "invisible" Web, Snippet generation, Summarization, Question Answering, Cross- Lingual Retrieval.	**15L**
Unit III	**Web Search Engine:** Web search overview, web structure, the user, paid placement, search engine optimization/spam, Web size measurement, search engine optimization/spam, Web Search Architectures. **XML retrieval:** Basic XML concepts, Challenges in XML retrieval, A vector space model for XML retrieval, Evaluation of XML retrieval, Text-centric versus data-centric XML retrieval.	**15L**

Text book(s):

1) Introduction to Information Retrieval, C. Manning, P. Raghavan, and H. Schütze, Cambridge University Press, 2008
2) Modern Information Retrieval: The Concepts and Technology behind Search, Ricardo Baeza -Yates and Berthier Ribeiro – Neto, 2nd Edition, ACM Press Books 2011.
3) Search Engines: Information Retrieval in Practice, Bruce Croft, Donald Metzler and Trevor Strohman, 1st Edition, Pearson, 2009.

Additional Reference(s):

1) Information Retrieval Implementing and Evaluating Search Engines, Stefan Büttcher, Charles L. A. Clarke and Gordon V. Cormack, The MIT Press; Reprint edition (February 12, 2016)

Course: USCS605	TOPICS (Credits : 03 Lectures/Week: 03) Digital Image Processing	
Objectives: To study two-dimensional Signals and Systems. To understand image fundamentals and transforms necessary for image processing. To study the image enhancement techniques in spatial and frequency domain. To study image segmentation and image compression techniques. **Expected Learning Outcomes**: Learner should review the fundamental concepts of a digital image processing system. Analyze the images in the frequency domain using various transforms. Evaluate the techniques for image enhancement and image segmentation. Apply various compression techniques. They will be familiar with basic image processing techniques for solving real problems.		
Unit I	**Introduction to Image-processing System :** Introduction, Image Sampling, Quantization, Resolution, Human Visual Systems, Elements of an Image-processing System, Applications of Digital Image Processing **2D Signals and Systems :** 2D signals, separable sequence, periodic sequence, 2D systems, classification of 2D systems, 2D Digital filter **Convolution and Correlation :** 2D Convolution through graphical method, Convolution through 2D Z—transform, 2D Convolution through matrix analysis, Circular Convolution, Applications of Circular Convolution, 2D Correlation **Image Transforms:** Need for transform, image transforms, Fourier transform, 2D Discrete Fourier Transform, Properties of 2D DFT, Importance of Phase, Walsh transform, Hadamard transform, Haar transform, Slant transform, Discrete Cosine transform, KL transform	**15L**
Unit II	**Image Enhancement :**Image Enhancement in spatial domain, Enhancement trough Point operations, Histogram manipulation, Linear and nonlinear Gray Level Transformation, local or neighborhood operation, Median Filter, Spatial domain High pass filtering, Bit-plane slicing, Image Enhancement in frequency domain, Homomorphic filter, Zooming operation, Image Arithmetic	**15L**

	Binary Image processing : Mathematical morphology, Structuring elements, Morphological image processing, Logical operations, Morphological operations, Dilation and Erosion, Distance Transform **Colour Image processing :**Colour images, Colour Model, Colour image quantization, Histogram of a colour image	
Unit III	**Image Segmentation:** Image segmentation techniques, Region approach, Clustering techniques, Thresholding, Edge-based segmentation, Edge detection, Edge Linking, Hough Transform **Image Compression:** Need for image compression, Redundancy in images, Image-compression scheme, Fundamentals of Information Theory, Run-length coding, Shannon-Fano coding, Huffman Coding, Arithmetic Coding, Transform-based compression, Image-compression standard	**15L**

Textbook(s):

1) Digital Image Processing, S Jayaraman, S Esakkirajan, T Veerakumar,Tata McGraw-Hill Education Pvt. Ltd., 2009

Additional Reference(s)*:*

1) Digital Image Processing 3rd Edition, Rafael C Gonzalez, Richard E Woods, Pearson, 2008
2) Scilab Textbook Companion for Digital Image Processing, S. Jayaraman, S. Esakkirajan And T. Veerakumar, 2016 (https://scilab.in/textbook_companion/generate_book/125)

Course: **USCS606**	**TOPICS (Credits : 03 Lectures/Week: 03)** **Data Science**	

Objectives:

Understanding basic data science concepts. Learning to detect and diagnose common data issues, such as missing values, special values, outliers, inconsistencies, and localization. Making aware of how to address advanced statistical situations, Modeling and Machine Learning.

Expected Learning Outcomes:

After completion of this course, the students should be able to understand & comprehend the problem; and should be able to define suitable statistical method to be adopted.

Unit I	**Introduction to Data Science:** What is Data? Different kinds of data,	**15L**

	Introduction to high level programming language + Integrated Development Environment (IDE), Exploratory Data Analysis (EDA) + Data Visualization, Different types of data sources, **Data Management**: Data Collection, Data cleaning/extraction, Data analysis & Modeling	
Unit II	**Data Curation:** Query languages and Operations to specify and transform data, Structured/schema based systems as users and acquirers of data Semi-structured systems as users and acquirers of data, Unstructured systems in the acquisition and structuring of data, Security and ethical considerations in relation to authenticating and authorizing access to data on remote systems, Software development tools, Large scale data systems, Amazon Web Services (AWS)	**15L**
Unit III	**Statistical Modelling and Machine Learning:** Introduction to model selection: Regularization, bias/variance tradeoff e.g. parsimony, AIC, BIC, Cross validation, Ridge regressions and penalized regression e.g. LASSO **Data transformations**: Dimension reduction, Feature extraction, Smoothing and aggregating **Supervised Learning**: Regression, linear models, Regression trees, Time-series Analysis, Forecasting, Classification: classification trees, Logistic regression, separating hyperplanes, k-NN **Unsupervised Learning**: Principal Components Analysis (PCA), k-means clustering, Hierarchical clustering, Ensemble methods	**15L**

Textbook(s):

1) Doing Data Science, Rachel Schutt and Cathy O'Neil, O'Reilly,2013
2) Mastering Machine Learning with R, Cory Lesmeister, PACKT Publication,2015

Additional Reference(s):

1) Hands-On Programming with R, Garrett Grolemund,1st Edition, 2014
2) An Introduction to Statistical Learning, James, G., Witten, D., Hastie, T., Tibshirani, R.,Springer,2015

Course: USCS607	TOPICS (Credits : 02 Lectures/Week: 03) Ethical Hacking	
Objectives: To understand the ethics, legality, methodologies and techniques of hacking. **Expected Learning Outcomes:** Learner will know to identify security vulnerabilities and weaknesses in the target applications. They will also know to test and exploit systems using various tools and understand the impact of hacking in real time machines.		
Unit I	**Information Security : Attacks and Vulnerabilities** **Introduction to information security** : Asset, Access Control, CIA, Authentication, Authorization, Risk, Threat, Vulnerability, Attack, Attack Surface, Malware, Security-Functionality-Ease of Use Triangle **Types of malware** :Worms, viruses, Trojans, Spyware, Rootkits **Types of vulnerabilities** : OWASP Top 10 : cross-site scripting (XSS), cross site request forgery (CSRF/XSRF), SQL injection, input parameter manipulation, broken authentication, sensitive information disclosure, XML External Entities, Broken access control, Security Misconfiguration, Using components with known vulnerabilities, Insufficient Logging and monitoring, OWASP Mobile Top 10, CVE Database **Types of attacks and their common prevention mechanisms** : Keystroke Logging, Denial of Service (DoS /DDoS), Waterhole attack, brute force, phishing and fake WAP, Eavesdropping, Man-in-the-middle, Session Hijacking, Clickjacking, Cookie Theft, URL Obfuscation, buffer overflow, DNS poisoning, ARP poisoning, Identity Theft, IoT Attacks, BOTs and BOTNETs **Case-studies** : Recent attacks – Yahoo, Adult Friend Finder, eBay, Equifax, WannaCry, Target Stores, Uber, JP Morgan Chase, Bad Rabbit	**15L**
Unit II	**Ethical Hacking – I (Introduction and pre-attack)** **Introduction**: Black Hat vs. Gray Hat vs. White Hat (Ethical) hacking, Why is Ethical hacking needed?, How is Ethical hacking different from security auditing and digital forensics?, Signing NDA, Compliance and Regulatory	**15L**

	concerns, Black box vs. White box vs. Black box, Vulnerability assessment and Penetration Testing. **Approach : Planning** - Threat Modeling, set up security verification standards, Set up security testing plan – When, which systems/apps, understanding functionality, black/gray/white, authenticated vs. unauthenticated, internal vs. external PT, Information gathering, Perform Manual and automated (Tools: WebInspect/Qualys, Nessus, Proxies, Metasploit) VA and PT, How WebInspect/Qualys tools work: Crawling/Spidering, requests forging, pattern matching to known vulnerability database and Analyzing results, Preparing report, Fixing security gaps following the report **Enterprise strategy** : Repeated PT, approval by security testing team, Continuous Application Security Testing, **Phases:** Reconnaissance/foot-printing/Enumeration, **Phases**: Scanning, Sniffing	
Unit III	**Ethical Hacking :Enterprise Security** **Phases : Gaining and Maintaining Access** : **Systems hacking** – Windows and Linux – Metasploit and Kali Linux, Keylogging, Buffer Overflows, Privilege Escalation, Network hacking - ARP Poisoning, Password Cracking, WEP Vulnerabilities, MAC Spoofing, MAC Flooding, IPSpoofing, SYN Flooding, Smurf attack, **Applications hacking** : SMTP/Email-based attacks, VOIP vulnerabilities, Directory traversal, Input Manipulation, Brute force attack, Unsecured login mechanisms, SQL injection, XSS, Mobile apps security, **Malware analysis** : Netcat Trojan, wrapping definition, reverse engineering **Phases :** Covering your tracks : Steganography, Event Logs alteration **Additional Security Mechanisms** : IDS/IPS, Honeypots and evasion techniques, Secure Code Reviews (Fortify tool, OWASP Secure Coding Guidelines)	**15L**

Textbook(s):

1) Certified Ethical Hacker Study Guide v9, Sean-Philip Oriyano, Sybex; Study Guide Edition,2016
2) CEH official Certified Ethical Hacking Review Guide, Wiley India Edition, 2007

Additional Reference(s):

1) Certified Ethical Hacker: Michael Gregg, Pearson Education,1st Edition, 2013
2) Certified Ethical Hacker: Matt Walker, TMH,2011
3) http://www.pentest-standard.org/index.php/PTES_Technical_Guidelines
4) https://www.owasp.org/index.php/Category:OWASP_Top_Ten_2017_Project
5) https://www.owasp.org/index.php/Mobile_Top_10_2016-Top_10
6) https://www.owasp.org/index.php/OWASP_Testing_Guide_v4_Table_of_Contents
7) https://www.owasp.org/index.php/OWASP_Secure_Coding_Practices_-_Quick_Reference_Guide
8) https://cve.mitre.org/
9) https://access.redhat.com/blogs/766093/posts/2914051
10) http://resources.infosecinstitute.com/applications-threat-modeling/#gref
11) http://www.vulnerabilityassessment.co.uk/Penetration%20Test.html

Suggested List of Practical – SEMESTER VI

Course: **USCSP601**	**(Credits : 02 Lectures/Week:06)** **Practical of Elective-I**	

USCS601: Wireless Sensor Networks and Mobile Communication

Practical experiments require software tools like INET Framework for OMNeT++, NetSim , TOSSIM, Cisco packet tracer 6.0 and higher version.

1. Understanding the Sensor Node Hardware. (For Eg. Sensors, Nodes(Sensor mote), Base Station, Graphical User Interface.)
2. Exploring and understanding TinyOS computational concepts:- Events, Commands and Task.
   - nesC model
   - nesC Components
3. Understanding TOSSIM for
   - Mote-mote radio communication
   - Mote-PC serial communication
4. Create and simulate a simple adhoc network
5. Understanding, Reading and Analyzing Routing Table of a network.
6. Create a basic MANET implementation simulation for Packet animation and Packet Trace.
7. Implement a Wireless sensor network simulation.
8. Create MAC protocol simulation implementation for wireless sensor Network.
9. Simulate Mobile Adhoc Network with Directional Antenna
10. Create a mobile network using Cell Tower, Central Office Server, Web browser and Web Server. Simulate connection between them.

USCS602: Cloud Computing

1. Study and implementation of Infrastructure as a Service.
2. Installation and Configuration of virtualization using KVM.
3. Study and implementation of Infrastructure as a Service
4. Study and implementation of Storage as a Service
5. Study and implementation of identity management
6. Study Cloud Security management

7. Write a program for web feed.
8. Study and implementation of Single-Sing-On.
9. User Management in Cloud.
10. Case study on Amazon EC2/Microsoft Azure/Google Cloud Platform

USCS603: Cyber Forensics

1. Creating a Forensic Image using FTK Imager/Encase Imager :

- Creating Forensic Image
- Check Integrity of Data
- Analyze Forensic Image

2. Data Acquisition:

- Perform data acquisition using:
- USB Write Blocker + Encase Imager
- SATA Write Blocker + Encase Imager
- Falcon Imaging Device

3. Forensics Case Study:

- Solve the Case study (image file) provide in lab using Encase Investigator or Autopsy

4. Capturing and analyzing network packets using Wireshark (Fundamentals) :

- Identification the live network
- Capture Packets
- Analyze the captured packets

5. Analyze the packets provided in lab and solve the questions using Wireshark :

- What web server software is used by www.snopes.com?
- About what cell phone problem is the client concerned?
- According to Zillow, what instrument will Ryan learn to play?
- How many web servers are running Apache?
- What hosts (IP addresses) think that jokes are more entertaining when they are explained?

6. Using Sysinternals tools for Network Tracking and Process Monitoring :

- Check Sysinternals tools

- Monitor Live Processes
- Capture RAM
- Capture TCP/UDP packets
- Monitor Hard Disk
- Monitor Virtual Memory
- Monitor Cache Memory

7. Recovering and Inspecting deleted files

- Check for Deleted Files
- Recover the Deleted Files
- Analyzing and Inspecting the recovered files

  Perform this using recovery option in ENCASE and also Perform manually through command line

8. Acquisition of Cell phones and Mobile devices
9. Email Forensics

- Mail Service Providers
- Email protocols
- Recovering emails
- Analyzing email header

10. Web Browser Forensics

- Web Browser working
- Forensics activities on browser
- Cache / Cookies analysis
- Last Internet activity

Course: **USCSP602**	**(Credits : 02 Lectures/Week:06)** **Practical of Elective-II**	

USCS604: Information Retrieval

Practical may be done using software/tools like Python / Java / Hadoop

1. Write a program to demonstrate bitwise operation.
2. Implement Page Rank Algorithm.
3. Implement Dynamic programming algorithm for computing the edit distance between

strings s1 and s2. (Hint. Levenshtein Distance)

4. Write a program to Compute Similarity between two text documents.
5. Write a map-reduce program to count the number of occurrences of each alphabetic character in the given dataset. The count for each letter should be case-insensitive (i.e., include both upper-case and lower-case versions of the letter; Ignore non-alphabetic characters).
6. Implement a basic IR system using Lucene.
7. Write a program for Pre-processing of a Text Document: stop word removal.
8. Write a program for mining Twitter to identify tweets for a specific period and identify trends and named entities.
9. Write a program to implement simple web crawler.
10. Write a program to parse XML text, generate Web graph and compute topic specific page rank.

USCS605: Digital Image Processing

Practical need to be performed using Scilab under Linux or Windows

1. 2D Linear Convolution, Circular Convolution between two 2D matrices
2. Circular Convolution expressed as linear convolution plus alias
3. Linear Cross correlation of a 2D matrix, Circular correlation between two signals and Linear auto correlation of a 2D matrix, Linear Cross correlation of a 2D matrix
4. DFT of 4x4 gray scale image
5. Compute discrete cosine transform, Program to perform KL transform for the given 2D matrix
6. Brightness enhancement of an image, Contrast Manipulation, image negative
7. Perform threshold operation, perform gray level slicing without background
8. Image Segmentation
9. Image Compression
10. Binary Image Processing and Colour Image processing

USCS606:Data Science

Practical shall be performed using R

1. Practical of Data collection, Data curation and management for Unstructured data (NoSQL)

2. Practical of Data collection, Data curation and management for Large-scale Data system (such as MongoDB)
3. Practical of Principal Component Analysis
4. Practical of Clustering
5. Practical of Time-series forecasting
6. Practical of Simple/Multiple Linear Regression
7. Practical of Logistics Regression
8. Practical of Hypothesis testing
9. Practical of Analysis of Variance
10. Practical of Decision Tree

Course: **USCSP603**	**(Credits : 01 Lectures/Week: 03) Project Implementation**	

Please Refer to Project Implementation Guidelines

Course: **USCSP604**	**(Credits : 01 Lectures/Week: 03) Practical of Skill Enhancement**	

USCS607 : Ethical Hacking

1. Use Google and Whois for Reconnaissance
2. a) Use CrypTool to encrypt and decrypt passwords using RC4 algorithm
   b) Use Cain and Abel for cracking Windows account password using Dictionary attack and to decode wireless network passwords
3. a) Run and analyze the output of following commands in Linux – ifconfig, ping, netstat, traceroute
   b) Perform ARP Poisoning in Windows
4. Use NMap scanner to perform port scanning of various forms – ACK, SYN, FIN, NULL, XMAS
5. a) Use Wireshark (Sniffer) to capture network traffic and analyze
   b) Use Nemesy to launch DoS attack
6. Simulate persistent cross-site scripting attack
7. Session impersonation using Firefox and Tamper Data add-on

8. Perform SQL injection attack
9. Create a simple keylogger using python
10. Using Metasploit to exploit (Kali Linux)

Project Implementation Guidelines

1. A learner is expected to carry out two different projects: one in Semester V and another in Semester VI.
2. A learner can choose any topic which is covered in Semester I- semester VI or any other topic with the prior approval from head of the department/ project in charge.
3. The Project has to be performed individually.
4. A learner is expected to devote around three months of efforts in the project.
5. The project can be application oriented/web-based/database/research based.
6. It has to be an implemented work; just theoretical study will not be acceptable.
7. A learner can choose any programming language, computational techniques and tools which have been covered during BSc course or any other with the prior permission of head of the department/ project guide.
8. A project guide should be assigned to a learner. He/she will assign a schedule for the project and hand it over to a learner. The guide should oversee the project progress on a weekly basis by considering the workload of 3 lectures as assigned.
9. The quality of the project will be evaluated based on the novelty of the topic, scope of the work, relevance to the computer science, adoption of emerging techniques/technologies and its real-world application.
10. A learner has to maintain a project report with the following subsections
    a) Title Page
    b) Certificate

    A certificate should contain the following information –
    - The fact that the student has successfully completed the project as per the syllabus and that it forms a part of the requirements for completing the BSc degree in computer science of University of Mumbai.
    - The name of the student and the project guide
    - The academic year in which the project is done
    - Date of submission,
    - Signature of the project guide and the head of the department with date along with the department stamp,

- Space for signature of the university examiner and date on which the project is evaluated.

c) Self-attested copy of Plagiarism Report from any open source tool.

d) Index Page detailing description of the following with their subsections:

- Title: A suitable title giving the idea about what work is proposed.
- Introduction: An introduction to the topic giving proper back ground of the topic.
- Requirement Specification: Specify Software/hardware/data requirements.
- System Design details : Methodology/Architecture/UML/DFD/Algorithms/protocols etc. used(whichever is applicable)
- System Implementation: Code implementation
- Results: Test Cases/Tables/Figures/Graphs/Screen shots/Reports etc.
- Conclusion and Future Scope: Specify the Final conclusion and future scope
- References: Books, web links, research articles, etc.

11. The size of the project report shall be around twenty to twenty five pages, excluding the code.
12. The Project report should be submitted in a spiral bound form
13. The Project should be certified by the concerned Project guide and Head of the department.
14. A learner has to make a presentation of working project and will be evaluated as per the Project evaluation scheme

Scheme of Examination

1. Theory:

I. Internal 25 Marks :

a) Test – 20 Marks

20 marks Test – Duration 40 mins It will be conducted either using any open source learning management system like Moodle (Modular object-oriented dynamic learning environment) **OR** A test based on an equivalent online course on the contents of the concerned course (subject) offered by or build using MOOC (Massive Open Online Course) platform.

b) 5 Marks – Active participation in routine class instructional deliveries
Overall conduct as a responsible student, manners, skill in articulation, leadership qualities demonstrated through organizing co-curricular activities, etc.

II. External 75 Marks as per University Guidelines

11. Practical and Project Examination:

There will be separate Practical examination for Elective-I, II, Skill enhansement and project of these Elective-I 100, Elective-II: 100 and Skill Enhansement: 50 and Project Implementation: 50.

In the Practical Examination of Elective-I and II, the student has to perform practical on each of the subjects chosen. The Marking Scheme for each of the Elective is given below:

	Subject Code	**Experiment-I**	**Experiment-II**	**Total Marks**
Elective-I	**USCSP501/ USCSP601**	Experiment-40+Journal-5 +viva-5 Total:50M	Experiment-40+Journal-5+viva-5 Total:50M	100 M
Elective-II	**USCSP502/ USCSP602**	Experiment-40+Journal-5 +viva-5 Total:50M	Experiment-40+Journal-5+viva-5 Total:50M	100 M

Project Implementation	**USCSP503/ USCSP603**	****Project Evaluation Scheme**	**50M**
Skill Enhancement	**USCSP504/ USCSP604**	Experiment-40+Journal:5+viva-5 Total-50M	**50M**
Total Marks			**300M**

(Certified Journal is compulsory for appearing at the time of Practical Examination)

****Project Evaluation Scheme:**

Presentation	**Working of the Project**	**Quality of the Project**	**Viva**	**Documentation**
10Marks	10 Marks	10 Marks	10 Marks	10Marks

(Certified Project Document is compulsory for appearing at the time of Project Presentation)

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TYBA Philosophy (2018-19)
Course Tile: Living Ethical Issues
Paper No. 6
Credits: 04
No. of Lectures: 45
Total Marks: 100

The overall objectives of the course are as follows:

1. To reflect on real world ethical questions and the issues they raise, and to discuss those issues in an informed way.
2. To demonstrate an ability to recognize, articulate, and apply ethical principles in various academic, professional, social, or personal contexts

Semester 5 (UAPHI-503)

Unit I: Bioethical Issues - I (12 lectures)

Abortion: the abortion debate: is the foetus a person? Arguments from pro-choice (abortionists) versus pro-life (anti-abortionists) arguments. Euthanasia: the moral issue: conflict between duty to prolong life versus duty to relieve pain; forms of euthanasia: voluntary/non-voluntary and active/passive; moral and legal justification of euthanasia: pros and cons. Surrogate motherhood: empowerment or exploitation; redefining the notion of 'mother' – genetic, biological and social; advantages and critique of surrogate arrangements.

Unit II: Bioethical Issues - II (11 lectures)

Ethical issues in experimentation on human subjects: the principles of respect for autonomy of persons, beneficence and justice. Moral status of animals: views of Peter Singer and Tom Reagan. Ethics of human cloning: what is human cloning?; issues that make human cloning attractive; ethical dangers involved in human cloning.

Unit III: Professional Ethics (11 lectures)

Medical ethics: informed consent and confidentiality. Journalistic ethics: truthfulness and objectivity. Advertising ethics:

Unit IV: Contemporary Debates - 1 (11 lectures)

Pornography and censorship: arguments for and against pornography; is censorship of pornographic material justified? Homosexuality: arguments for and against homosexuality; is State interference in individuals' sexual preferences justified? Sexual harassment: what counts as sexual harassment?

Semester End Exam Paper Pattern [80 marks]

1. There shall be four compulsory questions.
2. The four questions shall correspond to the four units.
3. All questions shall contain internal choice.
4. Each question shall carry a maximum of 20 marks.

Project Based Component [20 marks]
List of titles for semester 5 project:

1. Freedom of thought and expression – J S Mill
2. The case against animal rights
3. Media ethics: fake news
4. Feminist critique of pornography
5. Privacy and censorship
6. Ethics of organ donation
7. Patient doctor relationship
8. Legal ethics (Indian context)

Project Guidelines:

1. Students will select a project title from the list of topics for the semester specified in the course and indicate the same to the faculty member.
2. The list of students along with the topics chosen will be displayed by the College in the beginning of the Semester
3. Students can begin to work on their project only after the faculty member has approved the topic.
4. Each student will meet with the faculty to discuss the outline of his/her topic and discuss the list of relevant reading materials to be referred.
5. The student will write the project under the guidance of only the faculty member in charge of the course
6. Students will submit their research project as per guidelines specified by the faculty member.
7. The project must be submitted by the student to the college before appearing for the University examination

Reference list recommended for the course:

-------- Tom Beauchamp and LeRoy Walters (ed.) *Contemporary Issues in Bioethics* 5th edn.
-------- R.G. Frey and C.H. Wellman (ed.) *A Companion to Applied Ethics*.
-------- Deborah Bowman, John Spicer, Rehana Iqbal, *Informed Consent*
-------- Tom Beauchamp and James Childress*. Principles of Biomedical Ethics*.
-------- R.F. Smith. *Ethics in Journalism* 6th edn. (Blackwell, 2008)
-------- Margaret Crouch, *Thinking About Sexual Harassment: A Guide for the Perplexed*
-------- Vincent Barry (ed.) *Applying Ethics* 2nd edn.
-------- Hugh LaFollette (ed.) *Ethics in Practice: An Anthology*.
-------- David Linton. "Why is Pornography Offensive?"
-------- Louis Pojman, *Philosophy: The Quest for Truth* (see section 'Philosophy in Action')
-------- Tamara Roleff (ed.) *Biomedical Ethics*
-------- Andrew Cohen and C H Wellman, *Contemporary Debates in Applied Ethics*
-------- Jon Nuttal, *Moral Questions: An Introduction to Ethics*
-------- Manuel Velasquez and Cynthia Rostankowski (ed.) *Ethics: Theory and Practice*
-------- Nussbaum, M. & Sunstein, C. (ed.) *Clones and Clones*. Part III.
-------- Andrea Dworkin, *Pornography: Men Possessing Women*
--------- Catherine Mackinnon "Sexuality, Pornography, and Method: 'Pleasure Under Patriarchy'", *Ethics* 99: 314–346 (1989)

Semester 6 (UAPHI 603)

Unit I: Environmental ethics (12 lectures)

Land ethics with special reference to Aldo Leopold. Shallow and deep ecology models of sustainable development: Arne Naess. The claims of ecofeminism: is it an environmental ethic?

Unit II: Religious attitudes towards the environment (11 lectures)

Vedic-Hindu perspective on the environment: reverence and sanctity of nature? Judeo-Christian attitude towards the environment: dominion or stewardship? Buddhist view on environmental ethics.

Unit III: Corporate ethics (11 lectures)

Business ethics: can there be ethics in business? Models of business ethics. Do business corporate houses have social responsibility: arguments for and against CSR. Affirmative action: arguments for and against affirmative action

Unit IV: Contemporary Debates – 2 (11 lectures)

Hunger and poverty: Peter Singer. The case against assisting the poor: Garrett Hardin. Do we have obligations to future (human and non-human) generations?

Semester End Exam Paper Pattern [80 marks]

1. There shall be four compulsory questions.
2. The four questions shall correspond to the four units.
3. All questions shall contain internal choice.
4. Each question shall carry a maximum of 20 marks.

Project Based Component [20 marks]

List of titles for semester 6 project

1. Social ecology
2. Ethics of nuclear war
3. Affirmative action (reservations) in the Indian context
4. Does Nature have intrinsic value?
5. Ethical issues concerning climate change (global warming)
6. CSR – Any case study (Indian context)
7. Significance and impact of environmental movements/activism
8. Green technologies for sustainable development.

Project Guidelines:

1. Students will select a project title from the list of topics for the semester specified in the course and indicate the same to the faculty member.
2. The list of students along with the topics chosen will be displayed by the College in the beginning of the Semester

3. Students can begin to work on their project only after the faculty member has approved the topic.
4. Each student will meet with the faculty to discuss the outline of his/her topic and discuss the list of relevant reading materials to be referred.
5. The student will write the project under the guidance of only the faculty member in charge of the course
6. Students will submit their research project as per guidelines specified by the faculty member.
7. The project must be submitted by the student to the college before appearing for the University examination

Reading list (selected) recommended for project based work:

-------- R.G. Frey and C.H. Wellman (ed.) *A Companion to Applied Ethics*.
-------- Tom Beauchamp and James Childress. *Principles of Biomedical Ethics*.
-------- Dale Jamieson (ed.) *A Companion to Environmental Philosophy*
-------- Michael Zimmerman (ed.) *Environmental Philosophy*
-------- Peter Singer, *Practical Ethics*
-------- O.P. Dwivedi (ed.) *World Religions and the Environment*
-------- Christopher K. Chappell and Mary E. Tucker (ed.) *Hinduism and Ecology*
-------- Christopher Framarin "Hinduism and Environmental Ethics: An Analysis and Defense of Basic Assumption" in *Asian Philosophy* Vol. 22 No. 1 (2012)
-------- Louis Pojman (ed.) *Environmental Ethics: Readings in Theory and Application*.
-------- R.F. Smith. *Ethics in Journalism* 6th edn. (Blackwell, 2008)
-------- Nicholas Bunnin (ed.) *The Blackwell Companion to Philosophy*, see "Business Ethics"
-------- Vincent Barry (ed.) *Applying Ethics* 2nd edn.
-------- Hugh LaFollette (ed.) *Ethics in Practice: An Anthology*.
-------- Louis Pojman, *Philosophy: The Quest for Truth* (see section 'Philosophy in Action')
-------- Andrew Cohen and C H Wellman, *Contemporary Debates in Applied Ethics*
-------- Jon Nuttal, Moral Questions: *An Introduction to Ethics*
-------- Manuel Velasquez and Cynthia Rostankowski (ed.) *Ethics: Theory and Practice*
-------- Andrew Kernohan, *Environmental Ethics: An Interactive Introduction*

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Revised Syllabus (From 2012-13)

Foundation Course

for F. Y. B. A./ B. Sc./B Com.

Semester 1 Course Code: UA FC 1C1

Unit 2 Concept of Disparity- 1

Understand the concept of disparity as arising out of stratification and inequality;

Explore the disparities arising out of gender with special reference to violence against women, female foeticide (declining sex ratio), and portrayal of women in media; Appreciate the inequalities faced by people with disabilities and understand the issues of people with physical and mental disabilities.

Unit 4 The Indian Constitution:

Philosophy of the Constitution as set out in the Preamble; The structure of the Constitution- the Preamble, Main Body and Schedules; Fundamental Duties of the Indian Citizen;

tolerance, peace and communal harmony as crucial values in strengthening the social fabric of Indian society; Basic features of the Constitution

Unit 5 Significant Aspects of Political Processes:

The party system in Indian politics; Local self-government in urban and rural areas; the 73rd and 74th Amendments and their implications for inclusive politics;

Role and significance of women in politics.

Unit 6 Growing Social Problems in India

: a) Substance abuse- impact on youth & challenges for the future

b) HIV/AIDS- awareness, prevention, treatment and services

c) Problems of the elderly- causes, implications and response

d) Issue of child labour- magnitude, causes, effects and response

e) Child abuse- effects and ways to prevent

f) Trafficking of women- causes, effects and response

Revised Syllabus (From 2012-13)

Foundation Course for

F. Y. B.A / B Sc/ B Com

Semester II Course Code: UA FC 2C1

Unit 3 Ecology

Importance of Environment Studies in the current developmental context; Understanding concepts of Environment, Ecology and their interconnectedness; Environment as natural capital and connection to quality of human life; Environmental Degradation- causes and impact on human life; Sustainable development- concept and components; poverty and environment

FOUNDATION COURSE

SYBA BSc BCom Semester III

Module 1 Human Rights Provisions, Violations and Redressal

A. Scheduled Castes- Constitutional and legal rights, Forms of violations, Redressal mechanisms.

B. Scheduled tribes- Constitutional and legal rights, Forms of violations, Redressal mechanisms.

C. Women- Constitutional and legal rights, Forms of violations, Redressal mechanisms.

D. Children- Constitutional and legal rights, Forms of violations, Redressal mechanisms.

E. People with Disabilities, Minorities, and the Elderly population- Constitutional and legal rights, Forms of violations, Redressal mechanisms.

Module 2 Dealing with Environmental Concerns

A. Concept of Disaster and general effects of Disasters on human life- physical, psychological, economic and social effects.

B. Some locally relevant case studies of environmental disasters

C. Dealing with Disasters - Factors to be considered in Prevention, Mitigation (Relief and Rehabilitation) and disaster Preparedness

D. Human Rights issues in addressing disasters- issues related to compensation, equitable and fair distribution of relief and humanitarian approach to resettlement and rehabilitation.

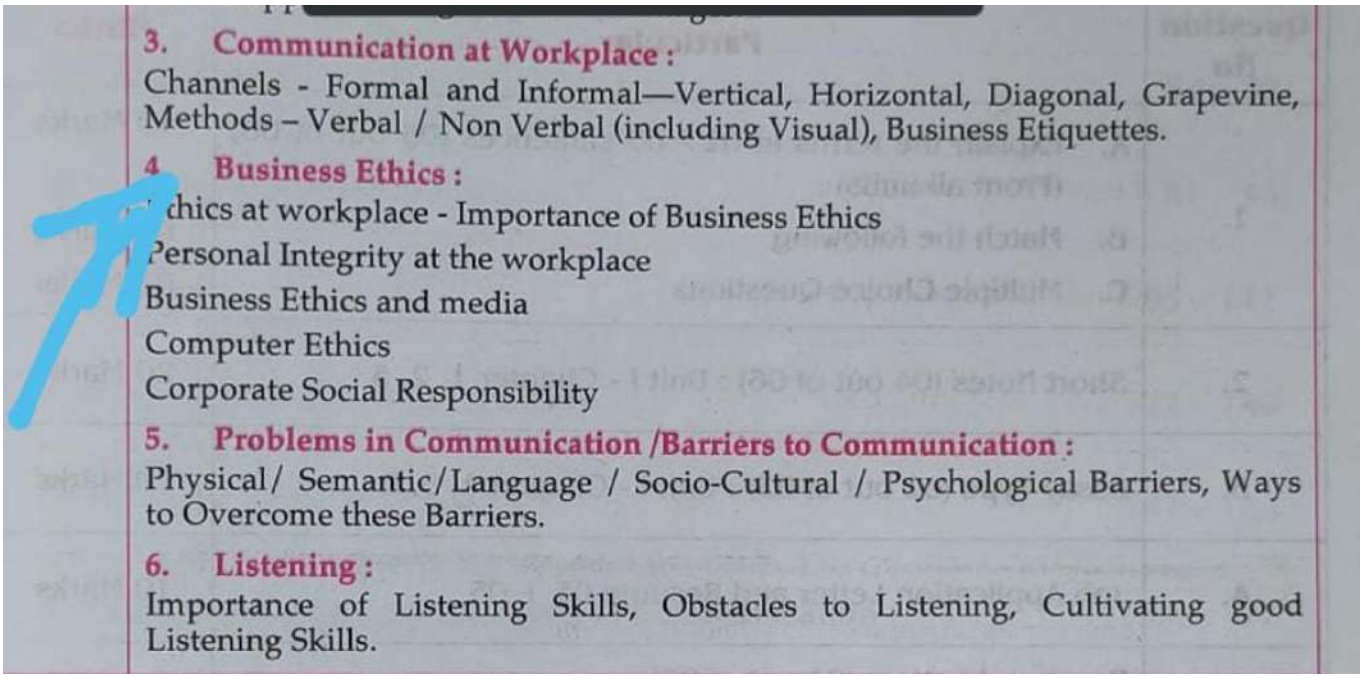
FOUNDATION COURSE

S.Y.B.A. B.Sc. B.Com. Semester IV

Module 2 Approaches to understanding Ecology

A. Understanding approaches to ecology- Anthropocentrism, Biocentrism and Eco centrism, Ecofeminism and Deep Ecology
B. Environmental Principles-1: the sustainability principle; the polluter pays principle; the precautionary principle.
C. Environmental Principles-2: the equity principle; human rights principles; the participation principle.

F.Y.B.COM. SYLLABUS - BUSINESS ETHICS



3. Communication at Workplace :

Channels - Formal and Informal—Vertical, Horizontal, Diagonal, Grapevine, Methods – Verbal / Non Verbal (including Visual), Business Etiquettes.

4. Business Ethics :

Ethics at workplace - Importance of Business Ethics

Personal Integrity at the workplace

Business Ethics and media

Computer Ethics

Corporate Social Responsibility

5. Problems in Communication /Barriers to Communication :

Physical/ Semantic/Language / Socio-Cultural / Psychological Barriers, Ways to Overcome these Barriers.

6. Listening :

Importance of Listening Skills, Obstacles to Listening, Cultivating good Listening Skills.

PSIT404d: Information Security Auditing

M. Sc (Information Technology)		Semester – IV	
Course Name: Information Security Auditing		**Course Code: PSIT404d**	
Periods per week (1 Period is 60 minutes)		4	
Credits		4	
		Hours	**Marks**
Evaluation System	**Theory Examination**	2½	60
	Internal	--	40

Course Objectives:

- Understand various information security policies in place.
- Assess an organization based on the needs and suggest the requisite information security policies to be deployed.
- Audit the organization across relevant policies and assist the organization in implementing such policies along with suggesting improvements.

Unit	Details	Lectures	Outcome
I	Secrets of a Successful Auditor Understanding the Demand for IS Audits Understanding Policies, Standards, Guidelines, and Procedures Understanding Professional Ethics Understanding the Purpose of an Audit Differentiating between Auditor and Auditee Roles Implementing Audit Standards Auditor Is an Executive Position Understanding the Corporate Organizational Structure Governance Strategy Planning for Organizational Control Overview of Tactical Management Planning and Performance Overview of Business Process Reengineering Operations Management Summary Audit Process Understanding the Audit Program Establishing and Approving an Audit Charter Preplanning Specific Audits Performing an Audit Risk Assessment Determining Whether an Audit Is Possible Performing the Audit Gathering Audit Evidence Conducting Audit Evidence Testing Generating Audit Findings Report Findings Conducting Follow-up (Closing Meeting)	**12**	**CO1**
II	Information Systems Acquisition and Development Project Governance and Management Business Case and Feasibility Analysis System Development Methodologies Control Identification and Design Testing Methodologies Configuration and Release Management	**12**	**CO2**

	System Migration, Infrastructure Deployment and Data Conversion Post-implementation Review		
III	Information Systems Operations Introduction Common Technology Components IT Asset Management Job Scheduling and Production Process Automation System Interfaces End-user Computing Data Governance Systems Performance Management Problem and Incident Management Change, Configuration, Release and IT Service Level Management Database Management Business Resilience Business Impact Analysis Data Backup, Storage and Restoration Business Continuity Plan Disaster Recovery Plans	**12**	**CO3**
IV	Information Systems Life Cycle Governance in Software Development Management of Software Quality Overview of the Executive Steering Committee Change Management Management of the Software Project Overview of the System Development Life Cycle Overview of Data Architecture Decision Support Systems Program Architecture Centralization vs. Decentralization Electronic Commerce System Implementation and Operations Understanding the Nature of IT Services Performing IT Operations Management Performing Capacity Management Using Administrative Protection Performing Problem Management Monitoring the Status of Controls Implementing Physical Protection	**12**	**CO4**
V	Protecting Information Assets Understanding the Threat Using Technical Protection Business Continuity and Disaster Recovery Debunking the Myths Understanding the Five Conflicting Disciplines Called Business Continuity Defining Disaster Recovery Defining the Purpose of Business Continuity Uniting Other Plans with Business Continuity Understanding the Five Phases of a Business Continuity Program Understanding the Auditor Interests in BC/DR Plans	**12**	**CO5**

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	CISA®: Certified Information Systems Auditor	David Cannon	SYBEX	Fourth Edition	2016
2.	CISA Review Manual 27th Edition		ISACA		2019
3.	CISA Certified Information Systems Auditor All-in-One Exam Guide, Fourth Edition,		O'Reilly	4th Edition	2019

Course Outcomes:

After completion of the course, a student should be able to:

CO1: Understand various information security policies and process flow, Ethics of an Information security Auditor.

CO2: Understand various information systems in an organization, their criticality and various governance and management policies associated with them.

CO3: Critically analyse various operational strategies like asset management, data governance etc. and suggest requisite changes as per organizations requirements with improvements.

CO4: Understand the information flow across the organization and identify the weak spots, and also suggest improvements to strengthen them.

CO5: Come up with strong strategies to protect information assets and come up with an efficient business continuity plan, disaster recovery strategy etc.

AC 26/2/2015
Item No. 4.70

UNIVERSITY OF MUMBAI

Syllabus for F.Y.B.Sc.
Program BSc
Course: ZOOLOGY

Semester I and II

(Credit Based Semester and Grading System
with effect from the academic year 2015–2016)

Syllabus Committee Members

Dr. Anil S. Singh	-	Convenor
Dr. Manisha Kulkarni	-	Co-convenor
Dr. Jyotsna Mahale	-	Co-convenor
Dr. Meenakshi Sundaresan	-	Co-convenor
Prof. Lata Sardesai	-	Co-convenor
Prof. P.C. Mathew	-	Co-convenor
Dr. Dilip Kakavipure	-	Co-convenor
Dr. V.M. Patole	-	Co-convenor
Dr. Kantilal H. Nagare	-	Co-convenor
Prof. Shanta Janyani	-	Co-convenor
Dr. S. Rangoonwala	-	Co-convenor
Dr. Minakshi Gurav	-	Member (Teacher)
Dr. Shirley B. Agwuocha	-	Member (Teacher)
Dr. Vishakha Shingala	-	Member (Teacher)
Dr. Gayathri N.	-	Member (Teacher)
Dr. Ansariya Rana	-	Member (Teacher)
Dr. Aditya S. Akerkar	-	Member (Teacher)
Dr. Shashikala Prajapati	-	Member (Teacher)
Dr. R.B. Singh	-	Member (Teacher)
Prof. Nitin Wasnik	-	Member (Teacher)
Prof. Nikhil C. Disoria	-	Member (Teacher)
Ms. Purva S. Prabhu	-	Member (Student)
Ms. Sachi R. Mayekar	-	Member (Student)
Ms. NehaVajandar	-	Member (Student)
Ms. Payal A. Shah	-	Member (Student)
Ms. Anuradha Gaikar	-	Member (Student)
Ms. Sonal S. Prabhulkar	-	Member (Student)

Syllabus for
FYBSc
Course – ZOOLOGY

1. Preamble
2. Pedagogy
3. Syllabus Semester I & II
4. References and Additional Reading
5. Scheme of Examination and Paper Pattern
6. Distribution of periods
7. Model Question bank

Aims

- To nurture interest in the students for the subject of Zoology
- To create awareness of the basic and modern concepts of Zoology
- To orient students about the importance of abiotic and biotic factors of environment and their conservation.
- To provide an insight to the basic nutritional and health aspects of human life.
- To inculcate good laboratory practices in students and to train them about scientific handling of important instruments.

Preamble

While presenting this new syllabus to the teachers and students of Semester I and Semester II (F.Y.B.Sc.) Zoology, I am extremely happy to state that for the first time efforts have been made to seek inputs of all the stake holders to make it more relevant.

In the first meeting of the Board of Studies an apex committee was formed to study syllabi worldwide with a view to include modern modules and plan semesters at UG and PG programs in advance to avoid overlapping and duplication of topics in various courses.

Meeting with the industry at the Indian Merchants' Chamber and with the meritorious alumni helped adding need based components. For the first time students were a part of the syllabus committee and the process became participative when the draft was finalized in an open meeting with all the Zoology teachers after having sought democratic criticism on the proposed syllabus placed on the University website for about one month.

While following the guidelines of UGC, use of animals is excluded from the practicals, substituting the same with audiovisual, ICT and simulation aids and that the syllabus is made more interesting with new, innovative topics. Providing the pedagogy as also indicating objectives and desired outcome of every topic for the teachers, and question bank for the students apart from the question paper pattern became an integral part of the syllabus, therefore.

Care is taken to provide the drafts from time to time and declare the final syllabus well in advance enabling the teachers to make preparations before commencement of the academic year and facilitating students to execute their right to know the details before admissions.

The success of this revamped syllabus will depend totally on the enthusiasm of the teachers which is very high all throughout the process and their hands will be strengthened by publishing the University text books for the first time. This curriculum of the Zoologists, for the Zoologists and by the Zoologists developed with the united efforts will take our ever progressive subject to greater heights in the years to come.

- VINAYAK DALVIE, Chairman, BOS in Zoology

Syllabus for
FYBSc.
Course – ZOOLOGY
To be implemented from Academic year 2015-16
SEMESTER - I

COURSE CODE	UNIT	TOPICS	CREDITS	LECTURES/WEEK
USZO101	I	Wonders of animal world	2	1
	II	Biodiversity and its conservation		1
	III	Footsteps to follow		1
USZO102	I	Laboratory safety and Units of Measurement	2	1
	II	Animal Biotechnology		1
	III	Instrumentation		1
USZOP1	Practical based on both courses		2	6

SEMESTER - II

COURSE CODE	UNIT	TOPICS	CREDITS	LECTURES/WEEK
USZO201	I	Population Ecology	2	1
	II	Ecosystem		1
	III	National park and Sanctuaries		1
USZO202	I	Nutrition and Health	2	1
	II	Public health and Hygiene		1
	III	Common human Diseases		1
USZOP2	Practical based on both courses		2	6

SYLLABUS F.Y.B.Sc. ZOOLOGY

UNIT WISE DISTRIBUTION

Semester I		Semester II	
Course 1	**Course 2**	**Course 3**	**Course 4**
Unit 1 Wonders of animal world	Unit 1 Laboratory Safety and Units of Measurement	Unit 1 Population Ecology	Unit 1 Nutrition and Health
Unit 2 Biodiversity and its Conservation	Unit 2 Animal Biotechnology	Unit 2 Ecosystem	Unit 2 Public Health and Hygiene
Unit 3 Footsteps to follow	Unit 3 Instrumentation	Unit 3 National Parks and Sanctuaries	Unit 3 Common Human Diseases
Practical (USZO P1)	Practical (USZO P1)	Practical (USZO P2)	Practical (USZO P2)

PEDAGOGY

F.Y.B.Sc. Syllabus

First year B.Sc. course is the entry point for the students to undergraduate classes which acts like a guiding force for them to make up their mind in selecting a subject they would wish to pursue their studies in future for carving their career in a particular field.

The syllabus committee in the subject of Zoology for F.Y.B.Sc. Class has designed this syllabus with a view that it is most appropriate time when we transform our traditional closed classroom teaching learning practices to more of field and activity based studies, the correct methodology for the study of Natural Sciences. It is recommended to orient the students about ecosystem, bio-diversity, wildlife conservation and management with the help of models, photographs, movies, documentaries, charts and use of ICT and then take learners to field to have realistic experiences. This will enable them to get true insight about endurance of animal life in relation to human activity inducing sentiment of love, care and protection in the young mind and heart leading to understand importance of co-existence and conservation of bio-diversity. An interaction with the officials of wildlife protection force should be allowed to get basic knowledge about the relevant acts through lectures which for creating awareness about these issues and also to make best use of the knowledge in their own interest as well as for the country. Instrumentation and Animal Biotechnology component would initiate academia- industry interface and should be edified in collaboration with expertise from relevant research institutes and industrial establishments and entrepreneurs by inviting them as guest speakers or through industrial visits, excursions for practical experience about the principle, working and application of the instruments for commercial use. Population ecology need to be explained in the context with census to enlighten pupils about the effect of diversity and dynamism of human population on socio economic status of India. Experts from the field of nutrition and health can be invited to enlighten learners on the topics of nutritional value of food, balanced diet, ill-effects of eating junk food and aerated drinks. Medical professionals, relevant NGO's maybe engaged to educate students regarding myth, precautionary measures, immunization drives of common diseases, ill-effects of self-medication and stress, significance of BMI through series of programmes. During medical emergencies it is of immense importance to provide first aid assistance to the diseased within the golden period i.e. of few minutes. This enhances the possibility to save life, thus it is strongly recommended to form a consortium of colleges to conduct training in rotation of first aid techniques for teachers and students both with the help of organizations like Red Cross Society, Health Department of Civic Bodies, Civil Defence Department and Local Self Government etc.

Dr. Anil S. Singh
Convenor

F.Y.B.Sc. ZOOLOGY

(THEORY)

SEMESTER I

USZO101 (Course 1)
Wonders of Animal World, Biodiversity and its Conservation

Unit 1: Wonders of Animal World (15 L)

Objective: *To take learners through a captivating journey of hoarded wealth of marvellous animal world.*

Desired Outcome*: Curiosity will be ignited in the mind of learners, to know more about the fascinating world of animals which would enhance their interest and love for the subject of Zoology.*

1.1**:** Echolocation in Bats and Cetaceans - Dolphins and Whales

1.2**:** Mechanism of Pearl formation in Mollusca

1.3**:** Bioluminescence in Animals: Noctiluca, Glow worm, Firefly, Angler Fish (Mechanism and use for the animal)

1.4**:** Regeneration in Animals - Earthworm (Annelida) and Lizard (Reptile)

1.5**:** Mimicry in Butterflies and its significance: Great Eggfly and Common Crow, Common Palmfly and Plain Tiger.

1.6**:** Mechanism of Coral formation and types of Coral reefs

1.7**:** Bird migration: Definition, types and factors inducing bird migration

1.8**:** Adaptive features of desert animals: Reptiles (Phrynosoma) and Mammals (Camel)

1.9**:** Breeding and Parental care in:

1.9.1**:** Pisces - Ovo-viviparous (Black Molly/Guppy), Mouth brooders (Tilapia), Brood pouches (Sea horse)

1.9.2**:** Amphibia - Mouth brooders (Darwin's Frog), Egg carriers (Midwife Toad)

1.9.3**:** Mammals - Egg-laying (Duck-billed Platypus), Marsupials (Kangaroo)

1.10**:** Aves: Brood Parasitism (Cuckoo)

Unit 2: Biodiversity and its Conservation (15 L)

Objective*: To orient learners about rich heritage of Biodiversity of India and make them understand significance of its conservation.*

Desired Outcome*: Learners would appreciate treasure of Biodiversity, its importance and hence would contribute their best for its conservation*.

2.1: Introduction to Biodiversity - Definition, Concepts, Scope and Significance

2.2: Levels of Biodiversity - Introduction to Genetic, Species and Ecosystem Biodiversity

2.3: Introduction of Biodiversity Hotspots- (Western Ghats and Indo-Burma Border)

2.4: Values of biodiversity - Direct and Indirect use value

2.5: Threats to Biodiversity - Habitat loss and Man-Wildlife conflict

2.6: Biodiversity conservation and management

2.6.1**:** Conservation strategies: *in situ*, ex-situ, National parks, Sanctuaries and Biosphere reserves.

2.6.2**:** Introduction to International efforts : Convention on Biological Diversity (CBD), International Union for Conservation of Nature and Natural Resources (IUCN), United Nations Environment Program - World Conservation Monitoring Centre (UNEP-WCMC)

2.6.3**:** National Biodiversity Action Plan, 2002

2.6.4**:** Introduction to Indian Wildlife (Protection) Act, 1972 and Convention for International Trade of endangered species

Unit 3: Footsteps to follow (15 L)

Objective*: To teach learners about innovative and novel work of scientists/philosopher/entrepreneurs in the field of biological sciences.*

Desired Outcome*: Minds of learners would be impulsed to think differently and would be encouraged ipso facto to their original crude ideas from the field of biological sciences.*

3.1**:** Dr. Hargobind Khorana (Genetic code)

3.2**:** Dr. Varghese Kurien (Amul –White revolution)

3.3**:** Dr. Salim Ali (Ornithologist)

3.4**:** Anna Hazare (Water Conservation-Ralegan Siddhi)

3.5**:** Baba Amte (Anandvan)

3.6**:** Kiran Mazumdar Shaw (Biocon)

3.7**:** Gadre Fisheries (Surimi)

Two cases preferably of local importance to the college be additionally taught.

USZO102 (Course 2)

INSTRUMENTATION and ANIMAL BIOTECHNOLOGY

Unit 1: Laboratory safety, Units and Measurement (15 L)

Objective: *To make learners aware of risks involved in handling of different hazardous chemicals, sensitive (electrical/electronic) instruments and infectious biological specimens especially during practical sessions in the laboratory and to train them to avoid mishap.*

Desired Outcome*: Learners would work safely in the laboratory and avoid occurrence of accidents (mishaps) which will boost their scholastic performance and economy in use of materials/chemicals during practical sessions.*

1.1: Introduction to good laboratory practices

1.2: **Use of safety symbols**: meaning, types of hazards and precautions

1.3: **Units of measurement**:

1.3.1**:** Calculations and related conversions of each: Metric system- length (meter to micrometer); weight (gram to microgram), Volumetric (Cubic measures)

1.3.2**:** Temperature: Celsius, Fahrenheit, Kelvin

1.3.3**:** Concentrations: Percent solutions, ppt, ppm, ppb dilutions, Normality, Molarity and Molality.

1.3.4**:** Biostatistics: Introduction and scope, Sampling and its types, Central Tendencies (mean, median, mode) Tabulation, Graphical representations (Histograms, bar diagrams, pie diagrams).

Unit 2: Animal Biotechnology (15 L)

Objective: *To acquaint learners to the modern developments and concepts of Zoology highlighting their applications aiming for the benefit of human being.*
Desired Outcome*: Learners would understand recent advances in the subject and their applications for the betterment of mankind; and that the young minds would be tuned to think out of the box.*

2.1: **Biotechnology**: Scope and achievements of Biotechnology (Fishery, Animal Husbandry, Medical, Industrial)

2.2: **Transgenesis**: Retro viral method, Nuclear transplantation method, DNA microinjection method and Embryonic stem cell method

2.3: Cloning (Dolly)

2.4: Ethical issues of transgenic and cloned animals

2.5: **Applications of Biotechnology**:

2.5.1**:** DNA fingerprinting: Technique in brief and its application in forensic science (Crime Investigation)

2.5.2**:** Recombinant DNA in medicines (recombinant insulin)

2.5.3**:** Gene therapy: Ex-vivo and *In vivo,* Severe Combined Immunodeficiency (SCID), Cystic Fibrosis

2.5.4**:** Green genes: Green Fluorescent Protein (GFP) from Jelly fish- valuable as reporter genes used to detect food poisoning.

Unit 3: Instrumentation (15 L)

Objective: *To provide all learners a complete insight about the structure and train them with operational skills of different instruments required in Zoology.*
Desired Outcome: *Students will be skilled to select and operate suitable instruments for the studies of different components of Zoology of this course and also of higher classes including research.*

3.1: Microscopy

3.1.1**:** Construction, principle and applications of dissecting and compound microscope.

3.2: Colorimetry and Spectroscopy - Principle and applications.

3.3: pH - Sorenson's pH scale, pH meter - principle and applications.

3.3: Centrifuge - Principle and applications (clinical and ultra centrifuges).

3.4: Chromatography - Principle and applications (Partition and Adsorption)

3.5: Electrophoresis - Principle and applications (AGE and PAGE)

SEMESTER I

Practical USZOP1 (Course I)

1. Mounting of foraminiferan shells from sand (any 3)
2. Study of types of Corals - Brain, Organ pipe, Stag Horn, Mushroom coral Study of

3Study of the following;

a. Symbiosis (Termite and Trychonympha, hermit crab and sea anemone)
b. Camouflage (leaf insect, chameleon)
c. Cannibalistic mate-eating animals (Spider and Praying Mantis)
d. Animal architects: Termites, Harvester ant and Baya weaver bird
e. Study of bioluminescent organisms – Noctiluca, glow worm, fire fly, angler fish.

4. Breeding and parental care in Amphibia- *Rhacophorus*, Midwife toad, Darwin's frog, Caecilian.
5. Mounting of scales of fish (placoid, cycloid and ctenoid)
6 a) Study of Adaptive radiation in Reptiles - Turtle, Tortoise, *Phrynosoma*, *Draco*)
   b) Identification and differentiation of venomous and non-venomous snakes (Scales, Fangs, Bite marks, etc.)
7. Study of Types of feathers(contour, filoplume, down), beaks(Nectar feeding , Insect catching, Fruit eating, Scavenging, Filter feeding), claws (perching, wading, swimming, hopping) in birds
8 a. Identification of birds - Coppersmith Barbet, Bulbul, Rose ringed Parakeet, Magpie Robin, two local birds.
   b. Field Report – To be done in a group of ten students (submission of written / typed report preferably along with photographs/ tables/ graphs.

Other Suggested topics for field observation/survey:

- Butterflies/ Fishes/ Migratory birds of local area.
- Variations in Human like Attached vs. Free Earlobes, Blood Groups, Eye colour, etc. using statistical method.

9. Observations of fauna in the field (with reference to theory syllabus).

***Note - The practicals may be conducted by using specimens authorised by the wild such other regulating authorities though it is strongly recommended that the same sh taught by using photographs/audio-visual aids/ simulations / models, etc. as recomme the UGC and as envisaged in the regulations of the relevant monitoring bodies. specimens, however, shall be procured for the purpose of conducting practicals me here-in-above.**

#There shall be at least one excursion/field trip

SEMESTER I

Practical USZOP1 (Course II)

1. Interpretation of safety symbols (toxic, corrosive, explosive, flammable, skin irritant, oxidizing, compressed gases, aspiration hazards and Biohazardous infectious material.)
   b) Study of Central tendencies and plotting of Bar diagram, histogram and pie diagram.
2. Identification of transgenic fish (Trout and Salmon) / cloned animals (Dolly sheep, cc cat and Snuppy dog) from photograph.
3. Extraction of fruit juice with pectinase from apple/guava/or any other suitable fruit
4. Calculation of pH of three different samples (one each acidic, alkaline and neutral) using pH paper/Universal Indicator and confirming the result with pH meter.
   Application of DNA Fingerprinting in criminology (photograph of electrophoretic pattern to be given for interpretation by the students)
5. a) Study of parts of microscope and their functions.
   b) Technique of focussing a permanent slide under 10x and 45x (objectives).
6. a) Dilution of given sample and estimation of OD by using colorimeter.
   b) Calculation of concentration from the given OD using formula.
7. Calculation of pH of three different samples (one each acidic, alkaline and neutral) using pH paper/universal indicator/pH indicator from red cabbage and confirming the result with pH meter.
8. a) Seperation of amino acids from the mixture by paper chromatography.
   b) Calculation of Rf value of separated pigments/amino acids from given chromatogram and their identification from standard chart.
9. a) Seperation of pigments by adsorption chromatography using chalk.
   b) Seperation of lipids by TLC,

***Note - The practicals may be conducted by using specimens authorised by the wildlife and such other regulating authorities though it is strongly recommended that the same should be taught by using photographs/audio-visual aids/ simulations / models, etc. as recommended by the UGC and as envisaged in the regulations of the relevant monitoring bodies. No new specimens, however, shall be procured for the purpose of conducting practicals mentioned here-in-above.**

Course I (USZO101)

REFERENCES AND ADDITIONAL READING

1. Wonders of the Animal World - University Text Book of Zoology, F.Y.B.Sc. Semester I Course 1. V.V. Dalvie, G.B. Raje, P. Sardesai, N.S. Prabhu, University Press.
2. Vertebrate Zoology Volume I- Jordan and Verma , S. Chand and Co.
3. Invertebrate Zoology Volume II- Jordan andVerma , S. Chand and Co.
4. Invertebrate Zoology- T. C. Majupuria , S. Nagin and Co.
5. Chordate Zoology- P. S. Dhami and J. K. Dhami , R. Chand and Co.
6. Invertebrate Zoology- P. S. Dhami and J. K. Dhami , R. Chand and Co.
7. Introduction to Vertebrates- Moore Cambridge University- Low Priced Edition
8. Zoology- S. A. Miller and J. B. Harley, Tata McGraw Hill
9. Modern Textbook of Zoology, Invertebrates, R. L. Kotpal
10. Fundamentals of Ecology- E. P. Odum , Sunders Publication
11. Fundamentals of Ecology- M.C.Dash-2nd edition, Tata McGraw Hill
12. Essentials of Ecology and Environmental Science - S.V.S Rana
13. Biodiversity- S.V.S Rana- Prentice Hall Publications
14. Modern Biology- V. B. Rastogi
15. Biology of Mollusca- D. R. Khanna
16. A Textbook of Zoology, Vol. II- T. Jeffery Parker and William. A. Haswell- Low Price Publications
17. Ecology and Environment- P. D. Sharma, R. K. Rastogi Publications
18. Introduction to Ecology- R. Dajoz
19. Wildlife Laws and its Impact on Tribes- Mona Purohit , Deep and Deep Publications
20. Biodiversity- K.C.Agarwal- Agro Botanica Publications
21. Butterflies of India – Isaac Kehimkar- BNHS Publication

Course II (USZO102)

REFERENCES AND ADDITIONAL READINGS

1. Basic Laboratory Techniques, Instrumentation and Biotechnology- University Text Book of Zoology, F.Y.B.Sc. Semester I Course 2. V.V. Dalvie, R. G. Deshmukh, R. D'souza and H.U. Shingadia University Press.

2. Introduction to Practical Biochemistry – David T. Plummer (Tata McGraw Hill Publishing Co. Ltd.)
3. Introductory Practical Biochemistry – S.K. Sawhney and Randhir Singh (Narosa Publishing House)
4. Methods in Biostatistics – B. K. Mahajan, (Jaypee Publications)
5. Microscopy and Cell Biology - V. K. Sharma, (Tata McGraw Hill Publishing Co. Ltd.)
6. Bioinstrumentation – L. Veerakumari, (M.J.P. Publishers)
7. Principles and Techniques of Practical Biochemistry – Keith Wilson and John Walker, (Cambridge University Press)
8. Biotechnology- Thieman and Pallidino, Pearson edu.
9. Biotechnology –Glick and Pasternak
10. Biochemistry –Satyanarayana
11. Understanding biotechnology- Aluizio Borem ,David Bowe-Low price edition –Pearson Publication
12. A Textbook of Biotechnology – R. C. Dubey, S. Chand Publication.
13. A Manual of Medical Laboratory Technology -A. H. Patel, Navneet Prakashan Ltd.
14. Biological instruments and methodology – Dr. P. K. Bajpai, S. Chand company Ltd.
15. Calculations in Molecular biology and Biotechnology - Frank H. Stephenson, Academic Press.

SCHEME OF EXAMINATION (THEORY)

(a) Internal assessment of twenty five (25) marks per course per semester should be conducted according to the guidelines given by University of Mumbai vide circular number UG/04 of 2014 Dated 5th June 2014 to be implemented from academic year 2014-15.

(b) External assessment of seventy five (75) marks per course per semester should be conducted as per the following skeleton question paper pattern.

(c) One practical examination of fifty (50) marks per course each should be conducted at the end of every semester.

SKELETON- EXAMINATION PATTERN FOR THE ABOVE SYLLABUS

All Questions are compulsory

Figures to the right indicate full marks

Time: 2.5 hours **Total marks: 75**

Q.1.	UNIT 1 Answer any four out of eight (5 marks each)	20 marks
Q.2.	UNIT 2 a. Answer any one of the two (10 marks) b. Answer any two out of the four (5 marks each)	20 marks
Q.3.	UNIT 3 Answer any two out of four (10 marks each)	20 marks
Q.4.	a. Unit 1 - (One note of five marks OR objective type questions) b. Unit 2 - (One note of five marks OR objective type questions) c. Unit 3- (One note of five marks OR objective type questions)	15 marks

*For Question 4 it is recommended to have objective questions such as –

(a) Match the column (b) MCQ

(c) Give one word for (d) True and False

(e) Define the term (f) Answer in one sentence etc.

MODEL QUESTION BANK SEMESTER I

USZO101(COURSE I)

Question bank is suggestive and not exhaustive. The paper setters are free to modify the questions or include new questions to the best of their wisdom

UNIT 1 - (05 Marks)

1. Write a note on echolocation in Dolphins/ Whales
2. Write a short note on : Pearl formation in Mollusca
3. Describe : Mechanism of bioluminescence
4. Enumerate the uses of bioluminescence
5. Describe the uses of bioluminescence for…… (Noctiluca, Glow worm, Firefly, Angler fish, etc.)
6. Write a short note on : Luciferin – Luciferase interaction
7. Describe the process of regeneration in Earthworm
8. What is regeneration? Explain the term with an example
9. What is mimicry? Explain with an example.
10. Describe: mimicry in butterfly
11. Describe briefly the formation of Corals
12. Write a short note on types of coral reefs.
13. Describe needs of migration in birds.
14. Describe briefly, the factors inducing migration in birds.
15. How does Camel adapt itself to the desert environment?
16. Describe parental care and breeding in ……. (Examples of Pisces, Amphibia)
17. Describe briefly: Brood parasite
18. Explain parental care in Duck-billed Platypus

UNIT 2 - (05 Marks/10 Marks)

Questions that could be asked for 10 marks:

1. Explain biodiversity and its importance. What is a biodiversity hotspot? Explain Western Ghats as biodiversity hotspot in India.
2. Explain: Direct use value / Indirect use value
3. Explain biodiversity and its types.
4. Enumerate and explain threats to biodiversity.
5. State the factors which amount to habitat loss.
6. Explain the concept of Man-Wildlife conflict with an example.
7. Give a detailed account on *in situ* hybridization and ex-situ hybridization

8. Describe National Park and state its importance in conservation
9. Describe Sanctuary and state its importance in conservation
10. Give a brief account on biosphere reserve.
11. Give a detailed account on: CBD (Convention on Biological Diversity).
12. Give an account of national biodiversity plan 2002.
13. Describe important clauses of Convention for International Trade of endangered species.

Questions that could be asked for 05 marks:

1. Explain biodiversity and mention its types.
2. Explain biodiversity and give two importance
3. Explain biodiversity hotspot
4. Describe *in situ* conservation strategies.
5. Write note on ex-situ conservation strategies.
6. Give an account of genetic / species / ecosystem biodiversity.
7. Enumerate importance threat to biodiversity.
8. State direct and indirect use value of biodiversity.

UNIT 3 - (10 Marks)

1. Give a detailed account on: ……(Name of the eminent personality) For e.g.: Gadre Fisheries, Kiran Mazumdar Shaw, Baba Amte etc.
2. Describe in detail - ……(Name of the case study)
   For e.g.: Amul white revolution, Biocon, Genetic code etc.
3. Give a detailed account on the contribution made by Dr.Salim Ali in the field of Ornithology.
4. What is white revolution? State contribution of Dr. Verghese Kurian for it.
5. Describe the work of water conservation of Anna Hazare.

MODEL QUESTION BANK SEMESTER I USZO102 (COURSE II)

Question bank is suggestive and not exhaustive. The paper setters are free to modify the questions or include new questions to the best of their wisdom

UNIT I: (5 marks)

1. Describe in brief (Minimum five points)
   a. Good laboratory practices
   b. Chemical hazards in a laboratory
   c. Physical hazards in a laboratory
   d. Biological hazards in a laboratory
   e. Personal hygiene in laboratory
   f. Waste disposal
2. Define and give conversions of the three scales of measuring temperature.
3. Define Molarity. How would you prepare
   a. 1 litre of 0.1 M NaOH solution? (Mol.wt. of NaOH=40)
   b. 100 ml of 1M NaOH
   c. 500 ml of 0.2 M NaOH
4. Define Normality. How would you prepare 1 litre of 2 N NaOH solution?
5. Explain briefly the measures of central tendencies?
6. Define mean, median and mode and explain each with an example.
7. The observations of length (in cm) of 10 fishes are 22, 24, 34, 26, 28, 31, 20, 25, 36, 32. Calculate the arithmetic mean of fish length (in cm).
8. Calculate the arithmetic mean for the following data on fish length by Direct method.

Class interval (length in cm)	5-15	15-25	25-35	35-45	45-55
Frequency (no. of fish)	9	21	40	22	8

9. Calculate the arithmetic mean for the above data on fish length by shortcut method.
10. How do you find the median of the data and state the significance of median?
11. What is mode? How do you calculate mode for ungrouped and grouped data?
12. What is random sampling? State the significance.
13. Explain simple, subdivided and multiple bar diagrams.
14. What is a pie diagram? Write the formula for calculating the angles of degrees for different components.
15. The following data shows the areas in million square miles of the oceans of the world. Construct a pie diagram for the data.

16.

Ocean	Pacific	Atlantic	Indian	Antarctic	Arctic	Total
Area (million sq. miles)	70.8	41.2	28.5	7.6	4.8	152.9

t

Plot a histogram/Bar diagram? Explain how it is constructed.

UNIT 2: (5 marks)

1. Give applications of Biotechnology in the field of Medicine / Fishery / Animal Husbandry.
2. Give the Scope of Biotechnology in different areas as a diagrammatic sketch
3. What is SCID? Name the scientist who discovered the gene therapy for it.
4. In SCID which enzyme does not work properly?
5. Which cells are used for SCID gene therapy?
6. Which gene is defective in SCID?
7. Define transgenesis and mention any two transgenic animals.
8. Ethical issues of transgenesis.
9. Enlist five applications of DNA finger printing.
10. What are green genes? State one application of it.

(10 marks)

1. Describe SCID and its treatment with suitable diagram.
2. Explain various methods of transgenesis.
3. What is Cystic fibrosis? Explain its diagnostic biotechnological method.
4. Define transgenesis and explain retro viral method with its application.

UNIT 3: (10 marks)

1. Describe the components of a compound microscope giving function.

2. Explain the principle and the applications of compound microscope.
3. Discuss in detail the principle, construction and applications of dissecting microscope.
4. Write the principle and applications of
    a. Colorimeter
    b. Centrifuge
    c. Spectroscopy
    d. Compound microscope
    e. Dissecting microscope
5. Explain the principle of centrifugation and add a note on its application.
6. What is pH? Give the principle and applications of pH meter.
7. Describe paper chromatography as a separation technique.
8. Describe Agarose gel electrophoresis. Add a note on its applications.
9. Explain the principle and applications of Polyacrylamide gel electrophoresis.
10. With the help of a diagram, explain the parts of a colorimeter. Discuss the principle and uses.
11. Describe principle and uses of colorimeter.
12. Explain the principle and application of adsorption chromatography.

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PRACTICALS

USZOP1 (Course I)

Skeleton -Practical Examination Question Paper Pattern

Time: 2 hrs **Marks: 50**

Q.1. From the given sample mount foraminiferan shells (Minimum three types) (15 Marks)

OR

Mounting of scales (placoid and cycloid/ctenoid) from fishes.

Q.2. Identify the photograph of the given animals and comment on the type of interaction /speciality. (symbiosis, camouflage, cannibalistic mate eating animals and animal architects,bioluminiscence). Any two (10 Marks)

Q.3. Identify giving reasons - Venomous/Non-venomous snake (from photographs). (5 Marks)

Q.4. Identification (one specimen each) (10 Marks)

a. Types of corals

b. Amphibians-breeding and parental care

c. Adaptive radiation in reptiles

d. Types of feathers/ claws in birds

e. Types of beaks in birds

Q.5. Field study report (Biodiversity) and viva on it. (10 Marks)

Semester I

USZOP1 (Course II)

Skeleton -Practical Examination Question Paper Pattern

Time: 2 hrs **Marks: 50**

Q. 1 Dilute the given sample and estimate the OD using colorimeter (Three dilutions) (15marks)

OR

Calculate concentration from given OD by formula (3 concentrations)

OR

Find pH of water samples (three) and comment on their chemical nature.

OR

Using red cabbage pH indicator, determine pH of the given samples and comment on their chemical nature

OR

Extract fruit juice using pectinase and compare the result with a set without using pectinase.

Q. 2. Perform experiment for separation of pigments by adsorption chromatography. (10Marks)

OR

Perform experiment for separation of mixture of amino acids by paper chromatography

OR

Calculate R_f value and identify the pigment from chromatogram.

OR

Perform Thin Layer Chromatography (TLC) for separation of lipids

Q. 3. Focus the given slide under 10 X and 45 X and show it to examiner. (5 Marks)

OR

Prepare a frequency distribution table / Plot histogram / Pie diagram / Bar diagram from the given data.

Q. 4. Identification (10 Marks)
(Safety Symbols (two), parts of compound microscope, transgenic animals, DNA fingerprinting)

Q. 5. Journal and Viva voce(on practical component) (10 Marks)

SEMESTER-II

USZO201 (Course: 3)

Ecology and Wildlife Management

Unit 1: Population ecology: (15 L)

Objective: *To facilitate the learning of population ecology, its dynamics and regulatory factors important for its sustenance.*

Desired Outcome: *This unit would allow learners to study about nature of animal population, specific factors affecting its growth and its impact on the population of other life form.*

1.1: Population dynamics

- 1.1.1: Population density
- 1.1.2: Natality
- 1.1.3: Mortality
- 1.1.4: Fecundity
- 1.1.5: Age structure
- 1.1.6: Sex ratio
- 1.1.7: Life tables
- 1.1.8: Survivorship curves
- 1.1.9: Population dispersal and distribution patterns
- 1.1.10 Niche concept

1.2: Population growth regulation

- 1.2.1: Intrinsic mechanism – Density dependent fluctuations and oscillations
- 1.2.2: Extrinsic mechanism- Density independent, environmental and climate factors, population interactions

1.3: Population growth pattern

- 1.3.1: Sigmoid
- 1.3.2: J Shaped

1.4: Human census (India) – Concept, mechanism and significance

Unit 2: Ecosystem: (15 L)

Objective: *To impart knowledge of different components of ecosystem and educate about essentials of coexistence of human beings with all other living organisms.*

Desired Outcome: *Learners will grasp the concept of interdependence and interaction of physical, chemical and biological factors in the environment and will lead to better understanding about implications of loss of fauna specifically on human being, erupting spur of desire for conservation of all flora and fauna.*

2.1: Concept of Ecosystems

2.1.1**:** Ecosystem - Definition and components
2.1.2**:** Impact of temperature on biota
2.1.3**:** Biogeochemical cycles (Water, Oxygen, Nitrogen, Sulphur)
2.1.4**:** Fresh water ecosystem – Lentic and Lotic
2.1.5**:** Food chain and food web in ecosystem (Fresh water and Grass land).
2.1.6**:** Ecological pyramids - energy, biomass and number.
2.1.7**:** Animal interactions (commensalism, mutualism, predation, antibiosis, parasitism)

Unit 3: National parks and Sanctuaries of India (15 L)

Objective: *To enlighten learners about the current status of wild life conservation in India in the light of guidelines from different relevant governing agencies vis-à-vis with adversity of poaching and biopiracy.*
Desired Outcome: *Learners would be inspired to choose career options in the field of wild life conservation, research, photography and ecotourism*.

3.1: Concept of Endangered and Critically Endangered species using examples of Indian Wildlife with respect to National Parks and Wildlife

Sanctuaries of India (Sanjay Gandhi National Park, Tadoba Tiger Reserve, Corbett National Park, Kaziranga National Park, Gir National Park, Silent Valley, Pirotan Island Marine Park, Keoladeo Ghana National Park, Bandipur Sanctuary)

3.2: Management strategies with special reference to Tiger and Rhinoceros in India

3.3: Ecotourism

3.4: Biopiracy

SEMESTER-II

Course: 4 [USZO 202]

NUTRITION, PUBLIC HEALTH AND HYGIENE

Unit 1: Nutrition and Health (15 L)

Objective: *To make learners understand the importance of balanced diet and essential nutrients of food at different stages of life.*

Desired Outcome: *Healthy dietary habits would be inculcated in the life style of learners in order to prevent risk of developing health hazards in younger generation due to faulty eating habits*.

1.1**:** Concept of balanced diet, dietary recommendations to a normal adult, infant, pregnant woman and aged.
1.2**:** Malnutrition disorders – Anemia (B_{12} and Iron deficiency), Rickets, Marasmus, Goiter, Kwashiorkar (cause, symptoms, precaution and remedy).
1.3**:** Constipation, piles, starvation, acidity, flatulence, peptic ulcers (cause, symptoms, precaution and remedy).
1.4**:** Obesity (Definition and consequences).
1.5**:** Importance of fibres in food.
1.6**:** Significance of breast feeding.
1.7**:** Swine flu and Dengue (cause, symptoms, precaution and remedy).
1.8**:** BMI calculation and its significance.

Unit 2: Public Health and Hygiene (15 L)

Objective: *To impart knowledge about source, quantum and need for conservation of fast depleting water resource and essentials of maintaining proper sanitation, hygiene and optimizing use of electronic gadgets.*

Desired Outcome: *Promoting optimum conservation of water, encouragement for maintaining adequate personal hygiene, optimum use of electronic gadgets, avoiding addiction, thus facilitating achievement of the goal of healthy young India in true sense.*

2.1: Health

2.1.1**:** Definition of Health, the need for health education and health goal.

2.1.2**:** Physical, psychological and Social health issues.

2.1.3**:** WHO and its programmes - Polio, Small pox, Malaria and Leprosy (concept, brief accounts and outcome with respect to India).

2.1.4: Ill effects of self-medication.

2.2: Water and water supply

2.2.1**:** Sources and properties of water.

2.2.2**:** Purification of water, small scale, medium scale and large scale (rapid sand filters)

2.2.3 **:** Water footprint (concept, brief accounts and significance).

2.3: Hygiene:

2.3.1**:** Hygiene and health factors at home, personal hygiene, oral hygiene and sex hygiene.

2.4: Radiation risk:

2.4.1**:** Mobile Cell tower and electronic gadgets (data of recommended level, effects and precaution).

2.5: First Aid:

2.5.1**:** Dog bite and its treatment.

2.6: Blood bank – Concept and significance

UNIT 3: Common Human Diseases and Disorders (15 L)

Objective: *To educate learners about causes, symptoms and impact of stress related disorders and infectious diseases.*

Desired Outcome: *Learners will be able to promptly recognize stress related problems at initial stages and would be able to adopt relevant solutions which would lead to psychologically strong mind set promoting positive attitude important for academics and would be able to acquire knowledge of cause, symptoms and precautions of infectious diseases*.

3.1: Stress related disorders

3.1.1**:** Hypertension, Diabetes type II, anxiety, insomnia, migraine, depression (cause, symptoms, precaution and remedy)

3.2: Communicable and non-communicable diseases

3.2.1**:** Tuberculosis and Typhoid

3.2.2**:** Hepatitis (A and B), AIDS, Gonorrhea and Syphilis

3.2.3**:** Diseases of respiratory system- Asthma, Bronchitis.

3.2.4: Oral Cancer

(Discuss cause/causative agents, symptoms, diagnostics, precaution /prevention and remedy)

SEMESTER II

Practical USZOP2 (Course III)

1. Interpretation of the given graphs/ tables and comment on pattern of population nature :
   i. Survivorship curve
   ii. Life tables
   iii. Fecundity tables
   iv. Age structure
   v. Sex ratio

2. a) Calculation of Natality, Mortality, Population density from given data
   b) Estimation of population density by capture recapture method

3. Interpretation of Growth curves (Sigmoid and J shaped)

4. Estimation of hardness from given water sample (tap water v/s well water)
5. Estimation of Free carbon dioxide (Free CO_2) from two different samples- aerated drinks(diluted) v/s tap water
6. Identification and interpretation of aquatic and terrestrial (Grassland) food chains and food webs
7. Construction of food chain/food web using given information/data.
8. a) Identification and interpretation of ecological pyramids of energy, biomass and number
   b) Construction of different types of pyramid from given data.

9. Study of the following:
   a) Endangered (Great Indian Bustard, Asiatic lion, Blackbuck, Olive Ridley sea turtle) and critically endangered species (Slender-billed vulture, Gharial, Malabar civet) of Indian wildlife and state reasons for their decline
   b) Study Biodiversity hotspots using world map (Western Ghats and Indo-Burma)
   Study of sanctuaries, national parks, biosphere reserves in India with respect to its brand fauna (as listed in theory)

***Note - The practicals may be conducted by using specimens authorised by the wildlife and such other regulating authorities though it is strongly recommended that the same should be taught by using photographs/audio-visual aids/ simulations / models, etc. as recommended by the UGC and as envisaged in the regulations of the relevant monitoring bodies. No new specimens, however, shall be procured for the purpose of conducting practicals mentioned here-in-above.**

#There shall be at least one excursion/field trip

SEMESTER II

Practical USZOP2 (Course IV)

. 1. Qualitative estimation of Vitamin C by Iodometric method.

2. Study of microscopic structure of starch granules of different cereals (wheat, maize and jowar).

3. a) Estimation of maltose from brown/white bread.
   b) Moisture content from biscuits or other suitable food products.

4. Food adulteration Test:
   a) Milk adulterants (starch and glucose), methylene blue reduction Test (MBRT).
   b) Adulterants in Cheese, Butter, Jaggery, Ghee, Honey, Iodised Salt.

5. a) Estimation of protein content of two egg varieties.
   b) Study of efficacy of different antacids (any two antacids).

6. .Study of Human Parasites

   Endoparasites - Protozoans (*Entamoeba, Plasmodium*),
   Helminths (*Ascaris, Wuchereria*),
   Ectoparasites (Head louse, tick) and Exoparasites (Bed bug, Mosquito).

7. Screening of anaemic/non-anaemic persons using $CuSO_4$ method.

8. First Aid – Demonstration Practical Training for teachers and students to be conducted by the experts from Redcorss, Civil defence, Civic authorities by individual institute or cluster colleges in rotation.

9. BMI analysis - Measurement of Height/ Weight and calculation of BMI using formula, preparation and submission of report. (10 students/ group-50 readings/group)

***Note - The practicals may be conducted by using specimens authorised by the wildlife and such other regulating authorities though it is strongly recommended that the same should be taught by using photographs/audio-visual aids/ simulations / models, etc. as recommended by the UGC and as envisaged in the regulations of the relevant monitoring bodies. No new specimens, however, shall be procured for the purpose of conducting practicals mentioned here-in-above.**

Semester II USZOP2 (Course III)

Skeleton -Practical Examination Question Paper Pattern

Time: 2 hrs **Marks: 50**

Q.1. Estimate Hardness from given water samples and compare the results. (15 Marks)

OR

Estimate Free CO_2 from given samples and compare the results.

Q.2. Solve the given problems (using statistical approach wherever possible) based on (Any two) (10Marks)

Natality
Mortality
Sex Ratio
Fecundity
Population density

Q.3. Identify brand animals (Min. 4) and place them in their respective National parks/ Sanctuaries on the given map quoting reasons for their decline. (5 Marks)

OR

Mark National parks and Sanctuaries on the map of India and mention the name of their brand animals stating reason for their decline. (Min. 4)

(5 Marks)

OR

Identify endangered and critically endangered animals (photographs) one each and state their reason of decline (5 Marks)

Q.4. Study the given information and give answers on the basis of food chain/food web and ecological pyramids. (10 Marks)

OR

Prepare food chain/food web and ecological pyramid from the given data and give its significance. (10 Marks)

OR

Identify and interpret the given graph/growth curve/age structure and comment on the pattern of population dispersal. (10 Marks)

OR

Determine Population density by capture and recapture method. (10 Marks)

Q.5. Journal and Viva voce (Based on practical component) (10 Marks)

Semester II USZOP2 (Course IV)

Skeleton -Practical Examination Question Paper Pattern

Time: 2 hrs **Marks: 50**

Q.1. Estimate Vitamin C from given sample. (15 Marks)

OR

Estimate Maltose content from bread.

OR

Estimate protein content from two different types of eggs.

Q.2. Analyse the given food sample and identify food adulterants (any 2 samples). (10 Marks)

OR

Evaluate milk quality by Methylene Blue Reduction Test (MBRT).

OR

Determine efficacy of different antacids (any two) on acidic solution.

Q.3. Determine moisture content from biscuits/ any other suitable food product. (5 Marks)

OR

On the basis of microscopic structure of starch granules identify different cereals (any two).

OR

Detect adulterants present in th given milk sample (any two).

OR

Determine whether given blood sample is from anaemic/non-anaemic person using $CuSO_4$ Method and suggest the appropriate diet.

Q.4. Identification (10 Marks)

a) One specimen of Protozoan Parasites.

b) One specimen of Helminth Parasites.

c) One specimen from Ectoparasite

d) One specimen from Exoparasite

e) One specimen from Endoparasite

Q.5. Submission of report of Body Mass Index (viva based on it) (10 Marks)

Note: There shall be at least one excursion/field trip.

USZO201 (Course III)

REFERENCES AND ADDITIONAL READING

1. Introduction to Ecology and Wildlife - University Text Book of Zoology, F.Y.B.Sc. Semester II Course 3. University Press.
2. Fundamentals of Ecology - Eugene P. Odum and Grey W. Barrett, Brook Cole/ Cengage learning
3. Fundamentals of Ecology - M. C. Dash , Tata McGraw Hill company Ltd, New Delhi
4. Ecology - Mohan P. Arora , Himalaya Publishing House
5. Field Biology and Ecology -- Alen H. Benton and William E. Werner ,Tata McGraw Hill ltd, New Delhi
6. Ecology and Environment - Sharma P. D , Rastogi Publication, Mumbai
7. Ecology : Principles and Applications - Chapman J.L , Cambridge University trust
8. Ecology - Subramaniam and Others, Narosa Publishing House
9. Wildlife laws and its impact on tribes - Mona Purohit, Deep and deep Publication
10. Biology - Eldra Solomon, Linda R. Berg and Diana W. Martin, Thomson/ Brooks/ Cole
11. Economic Zoology, Biostats and Animal Behaviour - Shukla, Mathur, Upadhyay, Prasad. Rastogi Publications.

USZO202 (Course IV)

REFERENCES AND ADDITIONAL READING

1. Common Diseases, Health and Hygiene - University Text Book of Zoology, F.Y.B.Sc. Semester II Course 4. University Press.
2. Common Medical Symptoms edited - P. J. Mehta National Inblisents and Distributions
3. Parks Textbook of Preventive and Social Medicine K. Park M/S Banarasidas Bhanot Jabalpar.
4. Human Physiology – Volume I – II C. C. Chatterjee, Medical Allied agency, Kolkatta.
5. Parasitology (Protozoology and Helminthoology) - K. D. Chatterjee, Chatterjee Medial Publishers.

6. Nand's handbook of Forensic Medicine and Toxicology - Apurba Nandy, NCBA publication.
7. Essentials of Public Health and Sanitation- Part I and Part II. All India Institute of Local Self Government.
8. Epidemiology and Management for Health Care for all. P.V. Sathe, A. P. Sathe, Popular Prakashan, Mumbai.
9. Textbook of Medical Parasitology- C. K. JayaramPaniker. Jaypee Brothers.
10. A Treatise on Hygiene and Public Health. -B. N. Ghosh. Calcutta Scientific Publishing Company.
11. Prevention of Food Adulteration, Act 1954. Asian Law House.
12. Clinical Dietetics and Nutrition - F. P. Antia and Philip, Oxford University Press.
13. A Complete Handbook of Nature Cure - Dr. H. K. Bakru, Jaico Publishing House.
14. Dietetics - B. Srilakshmi, New Age International (P) Ltd. Publishers.
15. Nutrition: Principles and Application in Health Promotion - J. B. Lippincott Company. Philadelphia.
16. Are You Healing Yourself Mr. Executive - Dr. R. H. Dastur. IBH Publishing Company.
17. Food Nutrition and Health- Dr. Shashi Goyal, Pooja Gupta, S. Chand Publications.
18. Public Health Nutrition. Edited - Michael J. Gidney, Barrie M. Margetts, John M. Kearney and Lenore Arab. Willey Blackwell Publication.
19. Food and Nutrition – Vol. I and II - Dr. Swaminathan , Bappco Publication.
20. Textbook of Human Nutrition - Mahtab Bamji, Prahlad Rao.
21. Total Health by Paramjit Rana.

SCHEME OF EXAMINATION THEORY

(a) Internal assessment of twenty five (25) marks per course per semester should be conducted as class test according to the guidelines given by University of Mumbai vide circular number UG/04 of 2014 Dated 5th June 2014 to be implemented from academic year 2014-15.

(b) External assessment of seventy five (75) marks per course per semester should be conducted as per the following skeleton paper pattern.

(c) One practical examination of fifty (50) marks per course each should be conducted at the end of every semester.

SKELETON- EXAMINATION PATTERN FOR THE ABOVE SYLLABUS

All Questions are compulsory

Figures to the right indicate full marks

Time: 2.5 hours **Total marks: 75**

Q.1.	UNIT 1 Answer any four out of eight (5 marks each)	20 marks
Q.2.	UNIT 2 a. Answer any one of the two (10 marks) b. Answer any two out of the four (5 marks each)	20 marks
Q.3.	UNIT 3 Answer any two out of four (10 marks each)	20 marks
Q.4.	a. Unit 1 - (One note of five marks OR objective type questions) b. Unit 2 - (One note of five marks OR objective type questions) c. Unit 3- (One note of five marks OR objective type questions)	15 marks

*For Question 4 it is recommended to have objective questions such as –

(a) Match the column (b) MCQ

(c) Give one word for (d) True and False

(e) Define the term (f) Answer in one sentence etc.

MODEL QUESTION BANK

SEMESTER II

USZO203 (COURSE III)

Question bank is suggestive and not exhaustive. The paper setters are free to modify the questions or include new questions to the best of their wisdom

UNIT 1: (10 marks)

Describe with suitable Example

1. J-Shaped and Sigmoid growth patterns
2. Population dispersal and distribution patterns
3. Natality and Mortality
4. Natality and Fecundity
5. Fecundity and Mortality
6. Density dependant fluctuation and oscillations
7. Population interactions
8. Age structure and population density
9. Concept of niche and its significance in population ecology.

Write notes on / Give a brief account of: (5 marks)

1. Population density
2. Natality
3. Mortality
4. Fecundity
5. Age structure
6. Sex ratio
7. Survivorship curve
8. Sigmoid growth pattern
9. J-shaped growth curve
10. Intrinsic mechanism
11. Extrinsic mechanism
12. Niche
13. Population dispersal and distribution pattern

UNIT 2: (5 marks)

1. Effect of temperature on metabolism

16. Impact of temperature on reproduction
17. Effect of temperature on animal behaviour
18. Define ecosystem and describe any two abiotic factors
19. Define ecosystem and describe any two biotic factors
20. Explain producers / autotrophs
21. Give a brief account of various levels of consumers in an ecosystem
22. Describe in short the inter-relationship between biotic and abiotic factors
23. Describe the following (any one of the cycles can be asked) water cycle, nitrogen cycle and oxygen cycle, sulphur cycle.
24. Explain any one of the following - lake or river
25. Explain food chain from terrestrial or aquatic ecosystem
26. What is food web and explain the same with a suitable example
27. Give a brief account of: Energy pyramid, Pyramid of biomass, Pyramid of numbers.

Unit 3: (10 marks question)

1. State the differences between National park and Wildlife Sanctuary?
2. Write an account of critically endangered species of Indian wildlife with at least two examples.
3. Explain briefly management strategy of any one tiger project in India.
4. Briefly explain management strategy of Rhinoceros project in India.
5. Write in detail about Indian Wildlife (Protection) Act 1972.
6. What is biopiracy? Explain with suitable examples.
7. Write a note on flora and fauna of Sanjay Gandhi national park.
8. Write an account of Tadoba tiger reserve project.
9. Give an account of biodiversity of Jim Corbett national park.
10. Write a note on Ranthambore Tiger reserve.
11. Write in details about Gir Lion project.
12. Write a note on Keoladeo Ghana National park.
13. Write an account of biodiversity of Silent valley.
14. Describe in detail about Bandipur sanctuary.
15. Write a note on ecotourism in India with few examples.

MODEL QUESTION BANK (COURSE IV) SEMESTERII

Question bank is suggestive and not exhaustive. The paper setters are free to modify the questions or include new questions to the best of their wisdom

Unit I (5 marks)

Explain the following:

1. Concept of balanced diet and dietary recommendations of any one of the following:
   a) Normal adult b)Infant c) Pregnant woman d) Aged
2. Cause and symptoms of the following: a) Anemia b) B_{12} deficiency c) Vitamin D deficiency d) Marasmus e) Kwashiorkar f) Goiter, g) Swine flu, h) Dengue
3. Precautions and remedy for all above mentioned health conditions.
4. Significance of breast feeding.
5. Importance of fibres in food.
6. Food adulterants and toxins with two side effects of each.
7. Causes, symptoms, precautions and treatment of a) Constipation, b) Piles, c) Insomnia, d) Starvation, e) Flatulence, f) Peptic ulcer, g) Obesity
8. BMI and its significance.

Unit II (5/10 marks)

Question of 5 marks:

1. Give a brief account and outcome of WHO Programs:
   a) Polio b) Smallpox c) Malaria d) Leprosy
2. a) Explain the concept of health goal and health knowledge.
   b) Enlist different needs of health education.
   c) State five points of social health issues.

Question of 10 marks:

1. Describe sources and properties of water in relation to human consumption.

2. Describe methods of purification of water – small scale, medium scale and large scale.
3. Explain the concept of water footprint and give its significance.
4. Describe disposal of human and animal waste – STP and ETP, its functioning and significance.
5. Give a brief of risk of radiation from mobile cell towers and electronic gadgets.
6. Explain the concepts of physical health, psychological health and myth related to it.
7. Describe the term hygiene and explain in brief health factors related to it at home.
8. Explain personal hygiene, oral hygiene and sex hygiene with significance of each.
9. Describe ill effects of self medication with respect to antibiotics and steroids.
10. Give brief account of first aid symbols.

Unit III (10 marks)

1. Explain causes, symptoms, precautions and remedy
   a) Hypertension b) Diabetes Type II c) Anxiety and Insomnia d) Migraine and depression
2. Explain causes, symptoms, precautions and remedy
   a) Tuberculosis b) Common flu c) Dengue d) Malaria e) Typhoid f) Hepatitis A g) Hepatitis B h) AIDS

B. Sc. (Information Technology)		Semester – VI	
Course Name: Cyber Laws		**Course Code: USIT607 (Elective I)**	
Periods per week (1 Period is 50 minutes)		**5**	
Credits		**2**	
		Hours	**Marks**
Evaluation System	**Theory Examination**	**2½**	**75**
	Internal	**--**	**25**

Unit	Details	Lectures
I	**Power of Arrest Without Warrant Under the IT Act, 2000:** A Critique, Crimes of this Millennium, Section 80 of the IT Act, 2000 – A Weapon or a Farce? Forgetting the Line Between Cognizable and Non-Cognizable Offences, Necessity of Arrest without Warrant from Any Place, Public or Otherwise, Check and Balances Against Arbitrary Arrests, Arrest for "About to Commit" an Offence Under the IT Act: A Tribute to Draco, Arrest, But NO Punishment! **Cyber Crime and Criminal Justice: Penalties, Adjudication and Appeals Under the IT Act, 2000:** Concept of "Cyber Crime " and the IT Act , 2000, Hacking, Teenage Web Vandals, Cyber Fraud and Cyber Cheating, Virus on the Internet, Defamation, Harassment and E-mail Abuse, Cyber Pornography, Other IT Act Offences, Monetary Penalties, Adjudication and Appeals Under IT Act , 2000, Network Service Providers, Jurisdiction and Cyber Crime, Nature of Cyber Criminality, Strategies to Tackle Cyber Crime and Trends, Criminal Justice in India and Implications on Cyber Crime.	**12**
II	**Contracts in the Infotech World:** Contracts in the Infotech World, Click-Wrap and Shrink-Wrap Contract: Status under the Indian Contract Act, 1872, Contract Formation Under the Indian Contract Act, 1872, Contract Formation on the Internet, Terms and Conditions of Contracts. **Jurisdiction in the Cyber World:** Questioning the Jurisdiction and Validity of the Present Law of Jurisdiction, Civil Law of Jurisdiction in India, Cause of Action, Jurisdiction and the Information Technology Act,2000, Foreign Judgements in India, Place of Cause of Action in Contractual and IPR Disputes, Exclusion Clauses in Contracts, Abuse of Exclusion Clauses, Objection of Lack of Jurisdiction, Misuse of the Law of Jurisdiction, Legal Principles on Jurisdiction in the United State of America, Jurisdiction Disputes w.r.t. the Internet in the United State of America.	**12**
III	**Battling Cyber Squatters and Copyright Protection in the Cyber World:** Concept of Domain Name and Reply to Cyber Squatters, Meta-Tagging, Legislative and Other Innovative Moves Against Cyber Squatting, The Battle Between Freedom and Control on the Internet, Works in Which Copyright Subsists and meaning of Copyright, Copyright Ownership and Assignment, License of Copyright, Copyright Terms and Respect for Foreign Works, Copyright	**12**

	Infringement, Remedies and Offences, Copyright Protection of Content on the Internet; Copyright Notice, Disclaimer and Acknowledgement, Downloading for Viewing Content on the Internet, Hyper-Linking and Framing, Liability of ISPs for Copyright Violation in the Cyber World: Legal Developments in the US, Napster and its Cousins: A Revolution on the Internet but a Crisis for Copyright Owners, Computer Software Piracy.	
IV	**E-Commerce Taxation: Real Problems in the Virtual World:** A Tug of War on the Concept of 'Permanent Establishment', Finding the PE in Cross Border E-Commerce, The United Nations Model Tax Treaty, The Law of Double Taxation Avoidance Agreements and Taxable Jurisdiction Over Non-Residents, Under the Income Tax Act, 1961, Tax Agents of Non-Residents under the Income Tax Act,1961 and the Relevance to E-Commerce, Source versus Residence and Classification between Business Income and Royalty, The Impact of the Internet on Customer Duties, Taxation Policies in India: At a Glance. **Digital Signature, Certifying Authorities and E-Governance:** Digital Signatures, Digital Signature Certificate, Certifying Authorities and Liability in the Event of Digital Signature Compromise, E-Governance in India: A Warning to Babudom!	**12**
V	**The Indian Evidence Act of 1872 v. Information Technology Act, 2000:** Status of Electronic Records as Evidence, Proof and Management of Electronic Records; Relevancy, Admissibility and Probative Value of E-Evidence, Proving Digital Signatures, Proof of Electronic Agreements, Proving Electronic Messages, Other Amendments in the Indian Evidence Act by the IT Act, Amendments to the Bankers Books Evidence Act, 1891 and Reserve Bank of India Act, 1934. **Protection of Cyber Consumers in India:** Are Cyber Consumers Covered Under the Consumer Protection Act? Goods and Services, Consumer Complaint, Defect in Goods and Deficiency in Services, Restrictive and Unfair Trade Practices, Instances of Unfair Trade Practices, Reliefs Under CPA, Beware Consumers, Consumer Foras, Jurisdiction and Implications on cyber Consumers in India, Applicability of CPA to Manufacturers, Distributors, Retailers and Service Providers Based in Foreign Lands Whose Goods are Sold or Services Provided to a Consumer in India. Amendments in Indian IT Act 2000	**12**

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Cyber Law Simplified	Vivek Sood	TMH Education		2001
2.	Cybersecurity Law	Jeff Kosseff	Wiley		2017